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Electrical World

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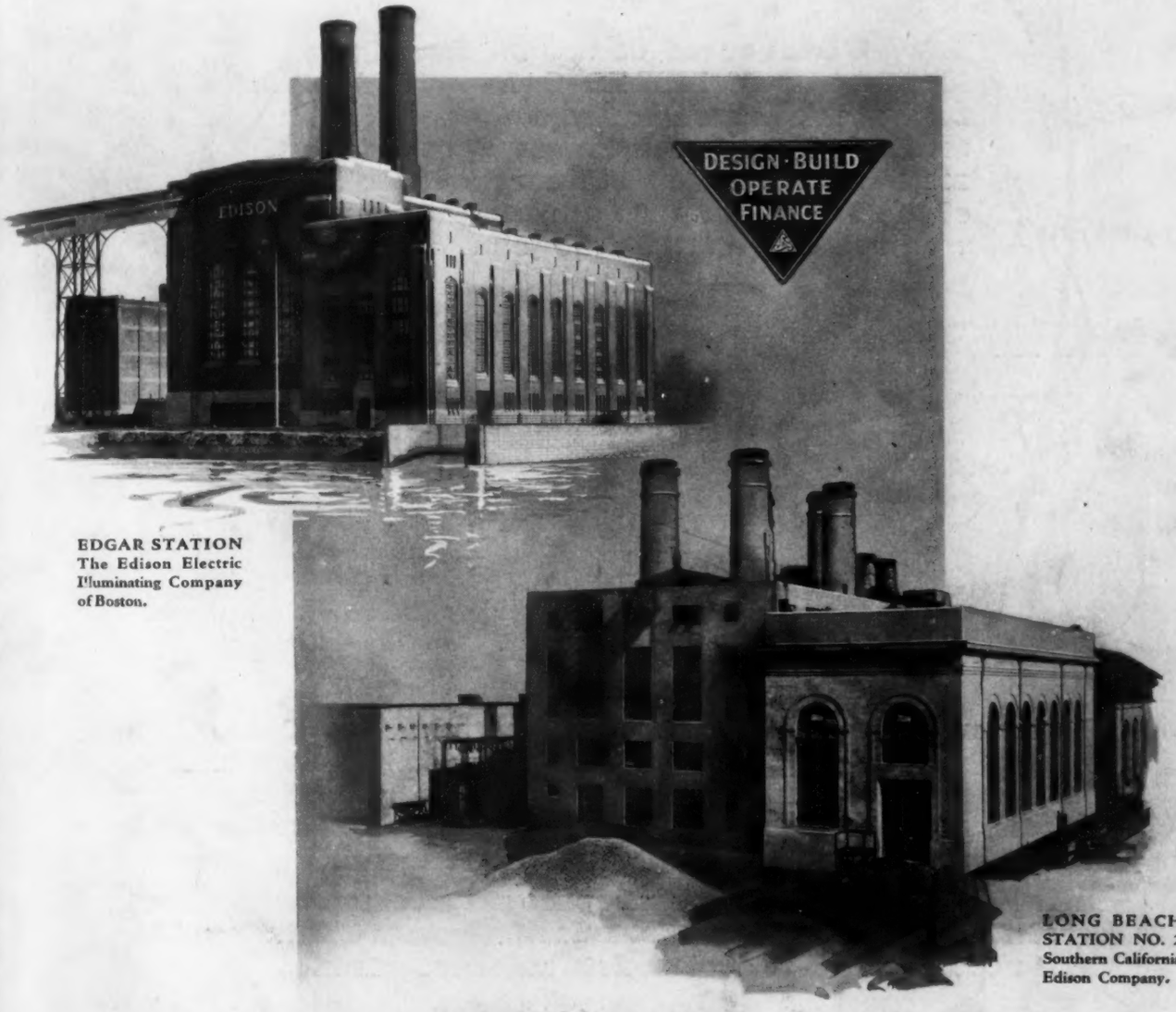

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Electrical World

The Consolidation of Electrical World, Electrical Engineer and American Electrician

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McGRAW-HILL PUBLISHING COMPANY, INC., Tenth Ave. at 36th St., NEW YORK, N. Y.

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Cable Address "Machinist, N. Y."

Publishers of
Engineering News-Record — American Machinist
Power — Chemical and Metallurgical Engineering
Coal Age — Engineering and Mining Journal
Ingeniería Internacional — Successful Methods
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Industrial Engineer — Radio Retailing
Journal of Electricity
(Published in San Francisco)
American Machinist—European Edition
(Published in London)

Member Audit Bureau of Circulations
Member Associated Business Papers, Inc.
Circulation of this issue, 19,500

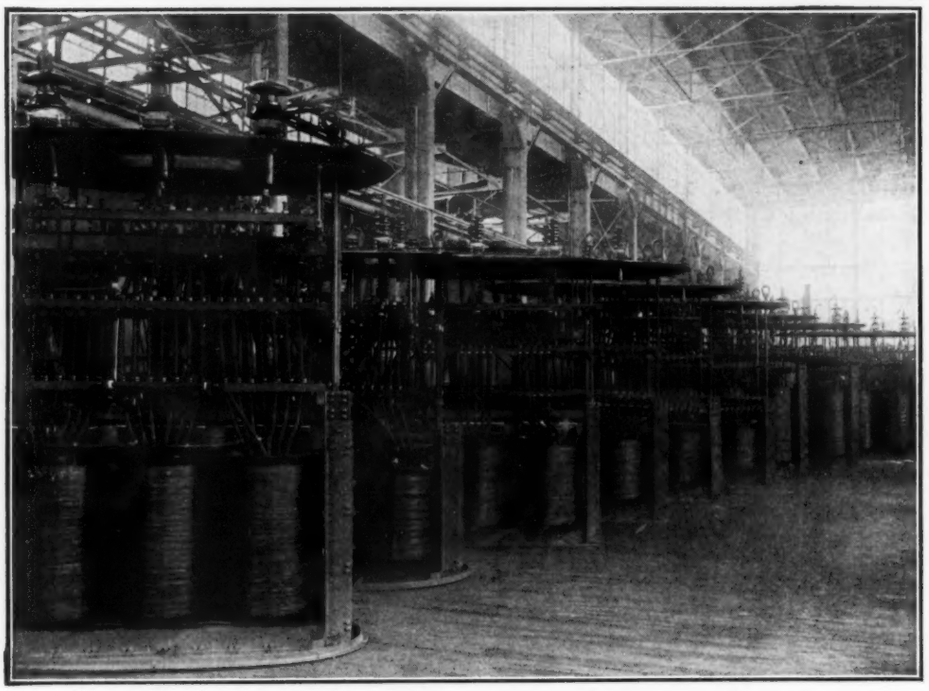
The annual subscription rate is $5 in the United States, Canada, Mexico, Alaska, Hawaii, Philippines, Porto Rico, Canal Zone, Honduras, Cuba, Nicaragua, Peru, Colombia, Bolivia, Dominican Republic, Panama, El Salvador, Argentina, Brazil, Spain, Uruguay, Costa Rica, Ecuador, Guatemala, Haiti and Paraguay. Extra foreign postage, $4 (total $9 or 38 shillings). Subscriptions may be sent to the New York office or to the London office. Single copies, postage prepaid to any part of the world, 25 cents.
Change of Address—When change of address is ordered the *new* and the *old* address must be given. Notice must be received at least ten days before the change takes place.

Copyright, 1926, by McGraw-Hill Publishing Company, Inc.

Published weekly
Entered as second-class matter Jan. 20, 1907, at the Post Office at New York, N. Y., under the Act of March 3, 1879.
Printed in U. S. A.

Advertising Index—Alphabetical, 94; Classified, 88, 90, 92; Directory of Engineers, 42, 43; Searchlight Section, 44-50

A Fundamental Invention Pittsburgh Polyphase Transformer



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Electrical World

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W. H. ONKEN, JR.
Editor

VOLUME 88 — *New York, Saturday, October 16, 1926* — NUMBER 16

The Five-Day Week and Electricity

HENRY FORD'S inauguration of the five-day week in his factories as a permanent policy is not so radical as it seems. With the increasing use of machinery and labor-saving appliances in industry it was inevitable that production would some day exceed demand and that rather than employ fewer hands the trend would be to shorter hours. Thus Mr. Ford avoids a serious social upheaval, just as his famous "flivver" has done. Were there nothing but expensive cars, available only to the rich, monopolizing the highways, democracy would have received a tremendous jolt; but through Mr. Ford's genius the high and low, the rich and poor enjoy luxury of travel unknown to previous generations.

But, without detracting in any degree from the well-earned laurels of Mr. Ford, it is proper to point out that to the electrical industry, and the electrochemical industry in particular, is due most of the credit for the shorter working week. The ferro-alloys of the electric furnaces at Niagara Falls have made the superior steel of the automobile possible, and the artificial abrasives have enabled men to fashion the parts quickly and cheaply. Without them automobile production on the present scale would be impossible and costs would be many times greater than what they are. Thus we have a demonstration of the national aspects of Niagara power whereby industries far removed from that waterfall enjoy its advantages and civilization everywhere reaps many of its rewards. What electricity has done for the automotive industries it is doing and can do for other industries, and thus it will become an even greater boon to men if they will but utilize its magic power.

Steam Railroads and Electrification

CHICAGO, as every traveler knows, is a great railroad center, and since the railroads there are not electrified the city is almost always enshrouded in a pall of soot and smoke. To remedy this evil the city has requested that the railroad terminals be electrified; but after years and years of debate just one railroad, the Illinois Central, has seen fit to meet public opinion. The other railroads do naught but object. This is rather characteristic of the railroads, and it is a sad commentary on railroad management that force must usually be applied to obtain improvements. Rarely will the railroads co-operate without an "if," and while it is conceded that the railroads need more public support and consideration in their present dilemma, it is futile for them to expect much sympathy from the public in a situation like that at Chicago.

The city desires to abate a serious smoke nuisance for which the railroads are chiefly responsible. Electrification offers a solution and also an improvement in railroading; but the pathway to clean air and progress is blocked by men lacking in faith and vision. We trust Chicago will insist on prompt electrification. The excellent example set by the Illinois Central is sure to steel public opinion against further delays. Power and equipment, dependable, abundant and proved by experience, are all at hand. The inclination to use them is all that is lacking, and if the steam railroads will not listen to reason, they may possibly bow to the public will through constraint.

Now for "Trade Relations"

THE idea of "public relations" has been sold to the electric power industry. The extent to which the principle has been applied and the degree to which the spirit of cheerful, helpful service has been accepted throughout the personnel of each local central-station company vary, of course, with the vision and proficiency of the management. But the principle today is recognized as sound and vital to the proper functioning and the success of any public utility, and the idea will be carried forward steadily until it is universally well practiced. Then, what next?

There was a very interesting indication in the last meeting of the N.E.L.A. Commercial Section executive committee that the importance of developing better "trade relations" is impressing itself upon the minds of central-station commercial executives as the next important step along this line. The growth of the local electrical league movement is probably as much responsible for this sentiment as any other thing, because in the affairs of the leagues the power company man comes into a new relationship with the contractor and the dealer and the representatives of the manufacturers and jobbers. In the league they are no longer thinking and acting as members of different branches of the electrical industry with many conflicting interests, but as members of an electrical family of the community, working for a common objective, and these men cannot talk and work and eat and play together without gaining a new understanding of each other and a more intelligent sympathy. This has been proved in many cities. And so a consciousness of trade relations as a major factor in the business of manufacturing and selling electric power is taking hold.

What do we mean—trade relations? Just the simple human influences of friendship founded on the confidence that comes from fair dealing, from frank and cordial association between men. Such relations find their natural expression in central-station policies that are considerate and recognize the interests of the local trade and the importance of its prosperity policies. They find their natural benefit in the indorsement and praise of all the electrical men of the community, who are in close and constant contact with every household and

can give priceless aid to public relations. They bring further practical reward in increased market development, because a healthy local trade puts in more adequate wiring installations and sells more appliances and equipment. Trade relations are worth just as much thought, attention and energy as have been so profitably expended in the last ten years in the promotion of public relations.

Rapid Growth of Sign Lighting

LAST year 167,000 new electric signs were erected in the United States, making a total of about 400,000 electric displays in operation at the beginning of this year. An idea of the increase in connected load for central stations is gained from the number of lamps which these signs require. The initial installation of the electric signs erected in 1925 took thirteen million electric lamps. The electric signs in operation at the beginning of this year require fifty million electric lamps to keep them going. The average sign last year contained 79 lamps, and statistics indicate that renewals in signs require 1.6 lamps per socket per year. The electric signs constructed last year cost $20,000,000, and the annual revenue to the central station companies from these signs was about $22,000,000.

It is seen from the foregoing figures that electrical advertising is growing rapidly and that it is a source of appreciable revenue. Furthermore, the growth last year, when considered in terms of the total number of electric signs in existence, is evidence that the field is still a large one for new and profitable business. No growth can be so large as last year's in electric signs without indicating that there is much new business still available in the field. This is a long-period lighting load which justifies sales effort on the part of electric service companies. As in other fields of lighting, the opportunities abound in all communities.

Higher Generator Voltages Have Significance

FOR years the voltage rating of most central-station generators was some variation of 2,300. Then 6,600-volt units became more familiar. Lately, in some of the larger generating stations, especially those supplying no local distribution, a generator voltage of 15,000 has made its appearance. The 208,000-kw. turbo-generator set just purchased by the State Line Generating Company will be designed for 18,000-volt generation.

Up to the advent of the "largest of the large" units generator voltages were apparently influenced by local distribution or station service requirements, although no uniformity of practice seems to have existed. The necessity of minimizing energy losses between the main generators and the step-up transformers urged higher generator voltages, whereas the need of supplying local distribution or station auxiliaries tended to hold down the voltage selected.

An additional factor begins to assume controlling importance, however, in the case of large generators now being purchased unless the generators are connected directly with their corresponding step-up transformers. This factor is the rupturing ability of oil circuit breakers in generator leads. For example, what manufacturer of oil circuit breakers would care to guarantee the operation of his product for rupturing the short-circuit current of the 76,000-kw. element of this set at less than 18,000 volts? Or, worse still, consider the rupturing duty imposed on circuit breakers between the complete set (235,000 kva.) and the corresponding step-up transformers. Still more severe rupturing duty will be imposed on circuit breakers between the generator bus and outgoing transformers if more than one of these mammoth sets is operated in parallel at generator voltage.

Couple with the current-rupturing problem the problems of handling at generator voltage the mechanical stresses during short circuits, the energy and consequent heat losses and the large amounts of power to be conducted away from a modern superpower station, and it becomes hardly visionary to expect even higher generator voltages as the size of the individual units and power stations increases.

A Misunderstanding That Utility Companies Can Remove

THERE exists a rather widespread public belief that the major investment and operating expense of rendering electric service to domestic customers resides in the power house. Merely telling the public that this is far from true will not convince it, because the power house is the only structure which impresses the uninformed observer as representing large investment and entailing heavy operating expense. That other utility property also represents large investment and that other activities also entail large operating expense has never been brought home to the public mind, and it is little wonder that customers have been so gullible as to believe that they should receive service at a price somewhere near the cost of generation.

Some companies have taken pains to point out to the public that it would not reduce the cost of domestic electric service an appreciable amount if electricity could be produced for nothing, inasmuch as the major part of the cost of rendering this service is in delivering the product. This explanation is a step in the right direction, but it has not been driven home because the impression is not made on the most convincing of the human senses—sight—and because facts are not presented to substantiate the statement. A more lasting impression of what a customer is paying for will be conveyed if the parts of a utility system which represent the major investments and the more expensive activities connected therewith are portrayed in graphic form. This has been found the right way by those utility companies which have tried it. The first thing is to make a serious attempt to present a complete physical picture representing the investment and operating expense of the central-station company. Then it will be found in all probability not only safe but advisable to go one step further and to present round figures on the pictures showing the total investment in the type of structure represented or the total operating expense for the type of activity portrayed. In this manner there would be done for electric utilities what unit and overall figures on rolling stock have recently done for a Southwestern railroad. That is, a better appreciation of investment and operating expenses would be fostered.

Any utility company which questions the worth of

this recommendation might first try the picture-figure method on an individual conscientious utility critic or objector and test his "reaction." Cases are on record where by this simple method antagonism has speedily been changed into a tolerant or even sympathetic attitude.

Centralized Control of Communication

THE chaotic situation with respect to radio communication has given rise to a notion that the time is coming when it may be necessary to establish some form of commission or committee to regulate communication of all forms, whether by wire, cable or radio. At present two governmental departments, those of Commerce and of State, and the Interstate Commerce Commission have more or less authority over commercial cables, wires and radio. In addition, the army and navy are directly concerned with military and naval communciation. This mixed type of organization has proved unwieldy and unsatisfactory for regulating and controlling an art which is developing rapidly and for maintaining a service which is essential to the public.

If the communication industry in all its branches does not grasp the situation and take steps to bring system out of chaos, there is no doubt that sooner or later the public will sanction legislation to create a communication bureau or commission. A political bureau in a technical business is not an ideal contrivance, but at its worst it is better than a wild and unorganized industry which sails without a rudder on a crowded sea. It is the opportunity and the duty of the communication industry to regulate itself in order to give the public a service that will be proof against attack and in order to keep government out of the business.

Doubling or Trebling Residence Lighting Revenue

DURING recent years extensive studies of residence illumination have shown that the average home is less than half lighted. Through these years the ELECTRICAL WORLD has broadcast in these columns the possibilities which are awaiting development by the commercial departments of central-station companies. At the late convention of the National Electric Light Association M. Luckiesh presented a concise summary of the new-business possibilities of what he termed "convenient and adequate utilitarian lighting for the home."

The present average annual residential lighting bill is $23.15, based on an average rate of 7.64 cents per kilowatt-hour. Exclusive of the many possibilities in the field of purely or dominantly artistic lighting, Mr. Luckiesh showed that the average annual residential lighting bill should be $61.24 in order to supply to the householder the proper amount of light needed purely for utilitarian purposes. The data are not merely theoretical, for they are founded upon careful studies and upon actual reports of increased revenue by central-station companies which have actually conducted campaigns covering one or more phases.

The modern kitchen unit produced an average increase of $4 in annual gross revenue. Replacing with 50-watt lamps all lamps of smaller size which now exist in utilitarian sockets would increase revenue from the average home $5.58. The additional portable lamps necessary account for $13.40 per year. Additional utilitarian brackets add $9.50 to the average annual revenue. Additional ceiling fixtures deemed necessary account for an increase of $3.82. A utility unit (containing a 150-watt daylight lamp) over the laundry tubs, operating only three hours a week, increases the annual revenue $1.79. The total increase in order that the average householder may enjoy convenient and adequate utilitarian lighting is found to be $38.09. Adding this amount to the present average annual residential lighting bill, a total of $61.24 results.

This is a conservative mark to shoot at, for it does not involve the debatable and unstandardizable esthetic phases of lighting. There is nothing surprising in these figures. They simply emphasize the well-known fact that electric lighting has not been sold to the householder to the extent that it should be. Here is a ready field for new-business departments. Its development does not involve much investment on the part of the customer and would help in the further development of electric heating and cooling through the increase in profits and lowering of rates. Great merchandisers build large volume upon low cost.

Interconnection and Investment Stabilization

INTERCONNECTIONS of power companies made upon sound engineering bases exert a decided influence in stabilizing investments already notable for their solidity. In a typical case the enlargement of a high-grade city steam plant by 30,000 kw. has been postponed for about three years as the direct result of tying the station into a regional trunk line. Meanwhile important improvements in the design of boiler plants and of prime movers have been going forward in the art, so that when the growth of the load requires local plant expansion advantage can be taken of these developments. Obsolescence works fast in the power generating field, and the savings realized through exchange of energy by co-ordinated plants are being increased in many cases by economies in the use of capital made possible by interconnection. In other words, certain intermediate steps in station development can sometimes be skipped as a result of interplant tie service, and this of course is directly reflected in capital requirements.

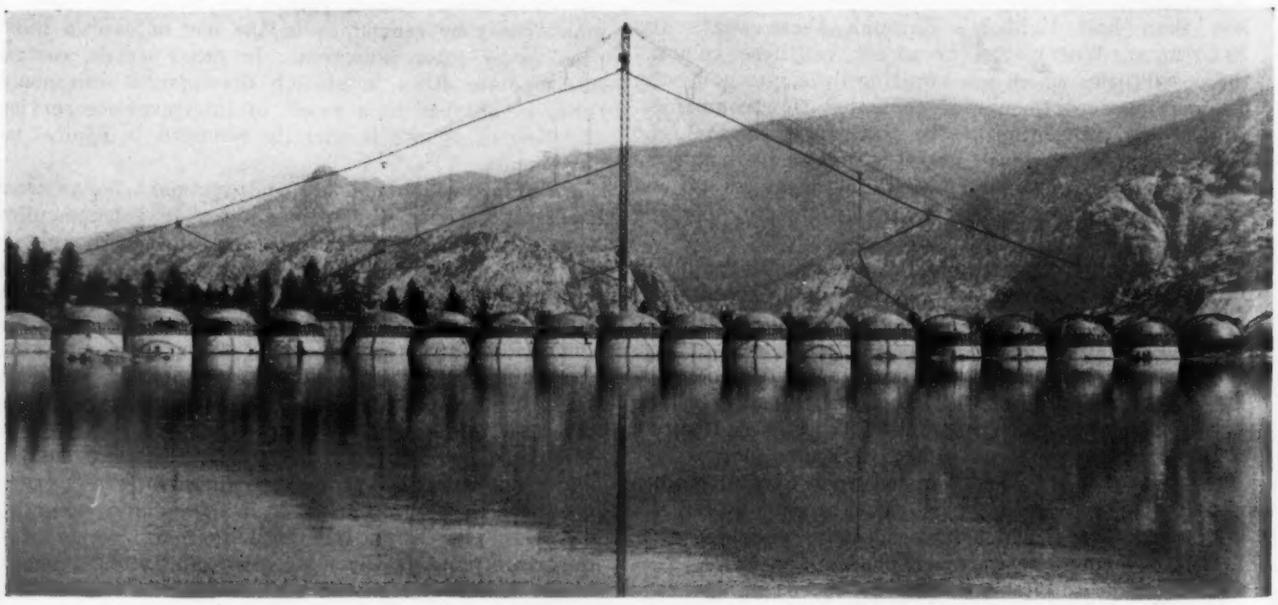
Anything which makes the investment dollar work harder postpones the demand for a corresponding amount of fresh capital. Some of the best thought of the utility industry is now devoted to this most important problem. Many fine examples have been made public of late of the actual economic benefits of interconnection, but those responsible for raising money for plant and system expansion may properly give more weight in prospectuses and in selling securities to the increased investment stability which is the reward of intelligent work in this field. The facts are easy to obtain on particular properties where interconnections have been thoroughly analyzed in their engineering and operating phases, and the security house which overlooks this point is throwing away an excellent opportunity to build additional business upon a still broader foundation than has hitherto been recognized in many detailed cases deserving such interpretation.

Section of dam from downstream side, showing buttresses

Florence Lake Dam of Southern California Edison Company

COMPLETION of the Florence Lake dam across the South Fork of the San Joaquin River by the Southern California Edison Company was announced Aug. 14. This dam, which crosses the river just down stream from the north portal of the Florence Lake tunnel, completed in February, 1925, has a crest measurement three-fifths of a mile in length and is the longest multiple-arch dam in existence. It is a part of the hydro-electric development program on the Big Creek and San Joaquin Rivers in Fresno County, California. Its construction will create a lake which will rival Huntington Lake in size and beauty, having a circumference of 9 miles as compared with 14 miles of shore line around Huntington Lake.

The excavation for the Florence dam was commenced in the fall of 1924. The first concrete was poured in March, 1925, and pouring continued during the summers of 1925 and 1926 up to the completion of the work. The dam has a maximum height above the channel of the river of 147 ft. Fifty-eight arches were required for the structure, supported by buttresses on 50-ft. centers. The thickness of the arch ring varies from 4.35 ft. at the foot to 1.5 ft. at the crest. The face of the dam has a slope of 42 deg. with the vertical.



Upstream face of dam section

Determining Clearance Between Conductors

Semi-Graphical Method of Determining Clearance Needed Between Conductors When They Are Displaced from Normal Arrangement or When Unequal Ice Loading Occurs

By C. D. GIBBS
Consulting Engineer, Huntington, Pa.

SOME of the conditions that are likely to be encountered when calculating clearances on transmission lines are:

1. Conductors in symmetrical arrangement with equal loading and either suspension or dead-end insulators.
2. Conductors in symmetrical arrangement with unequal loading and held by dead-end insulators.
3. Conductors in symmetrical arrangement with unequal loading and held by suspension insulators.
4. Conductors in unsymmetrical arrangement with equal loading and suspension or dead-end insulators.
5. Conductors in unsymmetrical arrangement with unequal loading and held by dead-end insulators.
6. Conductors in unsymmetrical arrangement with unequal loading and held by suspension insulators.

The method of procedure is similar in each case, but No. 5 is chosen as an example of common construction, since it represents the case of a line connecting a plant or substation to the first tower. Fig. 1 shows a double-circuit line on tower *T* connecting to a switching structure *S* with dead-end insulators used at both ends of this span. The sag in each case will be determined by the use of the Thomas curves. Where the supports are at unequal elevations, the sag of the center of the span will be determined from the equivalent horizontal span as shown in Fig. 2. The sag at any intermediate point of the span will be determined by use of the per cent sag curve, Fig. 3. The conductor in swinging to one side when exposed to wind makes an angle *A* with the vertical, the tangent of which equals the transverse pressure due to wind divided by the vertical weight.

Fig. 5 shows the outline of tower *T* and the switch structure *S* when viewed along the axis of the line. The phasing of each place is shown by the letters *A*, *B* and *C*. The straight lines *AA*, *BB* and *CC* of Fig. 5 correspond to the line *AA* of Fig. 2 and are the projection of the non-sag lines on a plane perpendicular to the axis of the line. Divide these lines into a convenient number of sections (ten in this case). It is apparent the minimum clearance will be between the *A* and *B* conductors. *A* is assumed loaded with ½-in. ice and 8-lb. wind at 0 deg. F. and *B* without ice with the same wind and temperature. The conductor used is No. 4/0 stranded copper strung so that the maximum tension of 4,500 lb. is attained when subject to "Class B" loading at 0 deg. F. The sag of the middle point is obtained as follows from the Thomas curves:

CALCULATION OF SAG

Diameter of cable = 0.530 in. Area of cable (*A*) = 0.1662 sq.in.

Wind pressure per foot of cable = 0.530 × 8/12 = 0.353 lb.
Weight per foot of cable = 0.645 lb.
Resultant load = 0.735 lb. per foot of cable.
Resultant angle of swing (without ice) = 28 deg. 43 min.
Resultant load with ice = 1.641 lb. per foot.
Resultant angle of swing (with ice) = 38 deg. 14 min.

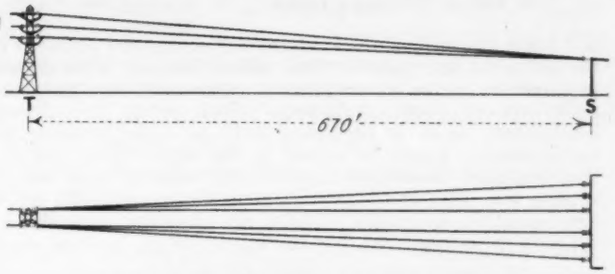


FIG. 1—DOUBLE-CIRCUIT LINE BETWEEN TOWER AND SWITCH STRUCTURE

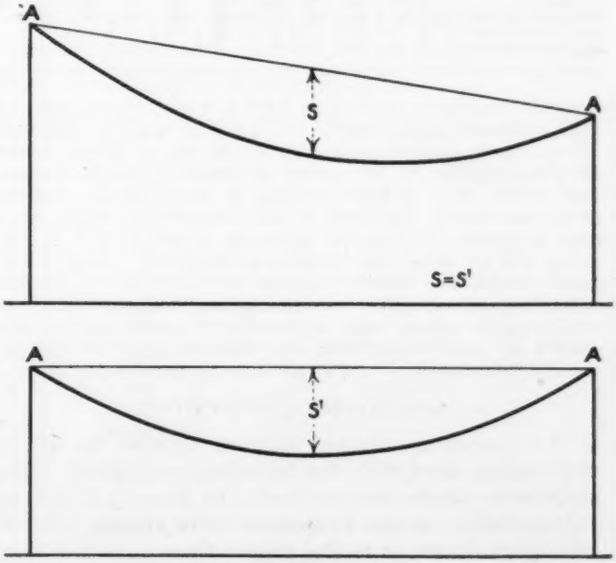


FIG. 2—EQUIVALENT HORIZONTAL SPAN USED WHERE SUPPORTS HAVE UNEQUAL ELEVATION

Span = 670 ft.
Tension (*T*) = 4,500 lb.
Temperature = 0 deg. F.
Modulus of elasticity (*E*) = 16,000,000.
Stress factor = 4,500 ÷ (1.641 × 670) = 4.09 lb. per foot per pound.
Sag per foot = 0.0308 (from the Thomas curves).
Sag = 20.6 ft. at 0 deg. F., 8-lb. wind and ½-in. ice.
Length per foot = 1.00258 (from the Thomas curves).
$1 + T \div EA = 1.001692$.
Increase of length with 1.641-lb. load = 0.001692.

Increase of length with 0.735 lb. load = 0.000757.
Unstressed length of cable = 1.000888 per foot of span.
Length per foot at new load (4.09 stress factor) = 1.001645.
Stress factor at new load = 4.83 (from the Thomas curves).
Sag per foot = 0.260 (from the Thomas curves).

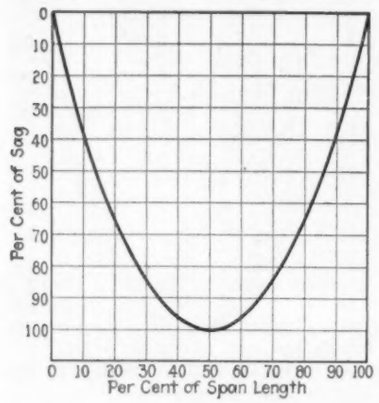


FIG. 3—PER CENT SAG CURVES MADE BY USE OF THOMAS CHARTS

Sag = 17.4 ft. at 0 deg. F., 8-lb. wind and no ice.

Applying the per cent sag curves of Fig. 3, Table I was obtained.

Lines are drawn from *AA* and *BB* (Fig. 5) at the assumed intervals, which make the angles 38 deg. 14 min. for *A* and 28 deg. 43 min. for *B* from the vertical in the direction of the wind. On these lines the sags of Table I are marked off and the curves *a* and *b* drawn. Curves *a* and *b* are the projections of the actual conductor positions on the perpendicular plane. The scaled distance between any two points in the same vertical plane will be the clearance between these conductors. Such points are already established, so it is necessary only to scale between the corresponding points as shown by the dotted lines and plot the clearance measured against per cent of span length (curve *a-b*, Fig. 5). The minimum clearance is 5.1 at 45 per cent of the span (300 ft. from the switching structure *S*).

Curve *b* is replotted for the condition of ice load as *b'*

TABLE I—INTERMEDIATE SAGS

Per cent span (assumed)	0	10	20	30	40	50	60	70	80	90	100
Per cent sag (Fig. 3)	0	36.5	64.5	84.5	96.0	100	96	84.5	64.5	36.5	0
Sag for conductor *A*	0	7.5	13.3	17.4	19.8	20.6	19.8	17.4	13.3	7.5	0
Sag for conductor *B*.	0	6.3	11.2	14.7	16.7	17.4	16.7	14.7	11.2	6.3	0

and the clearance plotted as (*a-b'*), which shows the normal clearance about twice the unequal loading clearance. When the ice-loaded cable *b'* loses its ice, it moves toward its final position *b*, but owing to inertia it carries beyond this point, and if equal swing is assumed, its extreme position is shown by curve *b"* and the corresponding clearance by curve (*a-b"*), the minimum of which is 3 ft. at a point 200 ft. from the switching structure. Since 70,000 volts cannot arc between conductors 0.53 in. in diameter when separated 3 ft., the spacing as used at tower and switching structure may be considered satisfactory. Care should be used in applying this method that the distances used in locating *A*, *B* and *C* are in a perpendicular plane.

CONDITIONS OF APPLICATION

The preceding method can be applied to all the enumerated cases with the following provisions: When suspension insulators are used, the lines *AA*, *BB* and *CC* are taken to the suspension wire clamps with the insulators drawn in at the proper transverse and longitudinal deflection. If the loads are equal at each side

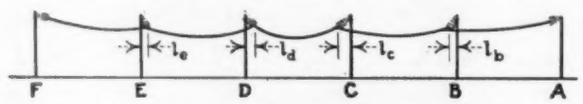


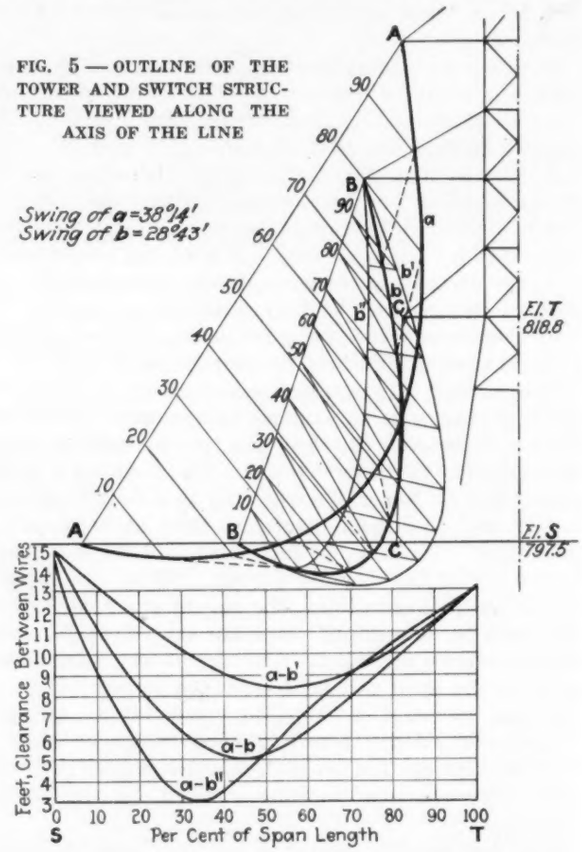
FIG. 4—ONE SECTION LOADED WITH ICE

of the suspension insulators, then there will be a transverse deflection only and it will be due to wind or a horizontal angle of the conductor at that point. The use then of suspension insulators affects this method of determining clearance by changing the position of the non-sag line and by changing the maximum sag, though the latter is affected only when unequal loading occurs.

The deflection of the insulator must be determined for accurate results and this means calculating all the spans between the nearest fixed points (dead-end insulators). Such a section of line is shown in Fig. 4, in which the span *CD* is loaded with ice, but none of the other spans is. The procedure is to obtain all the data for the vertical position of the suspension insulators in this way:

1. Calculate the unstressed length of conductor in each span.
2. Assume various values of the horizontal deflection of the insulator (l_c). $l_b = l_e$ and $l_d = l_c$.
3. This fixes the span length in each case.
4. Assume several tensions for each span length at the desired loading and solve for unstressed length.
5. Plot tension for each angle of insulator deflection.

FIG. 5 — OUTLINE OF THE TOWER AND SWITCH STRUCTURE VIEWED ALONG THE AXIS OF THE LINE



6. Calculate the corresponding horizontal component of tension.
7. Calculate horizontal tension due to insulator angle.
8. Plot the combined horizontal tension of span *AB* and insulator *B* on the curve for span *BC* and similarly for each span. The intersection of curves will give the angle of insulator deflection in the plane of the resultant force.

Knowing the transverse force and the vertical load, the transverse angle of the insulator string is obtained and a line drawn from the end of the tower arm at this angle and on this line is marked off the projection of the insulator length resulting from the longitudinal deflection of the insulator. The non-sag line *AA* is now established. The sag at the center of the span is obtained from the assumed loading and the already determined span length and tension. With line *AA* and center sag known, the semi-graphical method can be applied to determine the clearance when suspension insulators are used.

Range-Load Policies

Cost of Installing Ranges Carried by Nominal Customer Charge and Profit on Ranges—Utility Merchandising Stimulates Dealers' Business

DATA kept by the Consumers Power Company on the electric range load connected in its fifteen districts in Michigan show some interesting facts which answer several questions that have been raised by executives. One is that 1,082 domestic ranges with a total rating of approximately 7,500 kw. have been connected from Jan. 1, 1925, to June 1, 1926, at a total cost for strengthening and extending services of $66,579. This gives an additional distribution system investment of $61.50 per range or $8.88 per kilowatt connected. Owing to the possibility that records for the first twelve months may not have been reported by the districts as carefully as those for the last five months (January to May, 1926, inclusive), it is likely that the unit cost of strengthening or extending service facilities per range for 1926 is more nearly $65. As the number of ranges in a district increases it may be expected that the unit cost of strengthening or extending service facilities will decrease.

As indicated by the accompanying table, the additional distribution system investment has run more in some cases and less in others, a larger expenditure being required where the distribution system was installed before the company's existing standards of construction were put into effect or where an extra long secondary was involved, as in sparsely settled districts, etc. The policy in handling distribution extensions or improvements for ranges will be explained later.

The service requirements for a domestic range have been found to be about the same regardless of the individual range rating. In one district, where the company does not own the gas company, all new secondary construction and service wires are installed so they will care for range loads, even though ranges are not yet installed. It is contended by the company that the entire expense of strengthening or extending service facilities to accommodate range loads cannot be charged against ranges alone, inasmuch as the facilities will enable taking on considerable future growth in residence load.

Considering the fact that domestic ranges (according to a study made in one district) may be expected to produce an average consumption of 1,750 kw.-hr. per year and that chiefly on the lowest step of the energy rate, the Consumers Power Company estimates that each domestic range brings in a revenue of about $60 per year. Thus it can be seen that the average first year revenue from domestic ranges approximately offsets the average cost of strengthening or extending services, although this is not true in a few individual cases, as indicated by the accompanying table. (It should be observed that the figures on kilowatt-hours added per year by the range installations are estimates made by the individual districts and differ between districts, although the average per range is not far different from data that have been collected recently on typical installations in district F.)

In each district a uniform range installation charge is being added to the selling price of the range. As may be noted by comparing the cost of installing ranges with the total amount received for installing them, the installation charges collected from customers are less than the actual cost of the installation. However, rather than increase the initial cost of ranges to the customers by a larger installation charge and thereby increase

Cost of Installing Ranges and Strengthening or Extending Service Facilities

(First group for the year 1925; second group for January to May, 1926, inclusive; kilowatt-hour consumption was estimated by each district reporting)

	Ranges Sold by Appliance Department					Ranges Sold by Others			Total Ranges Added to System				
District	No.	Connected Load (Kw.) Added	Kw.-Hr. per Year Added (Est.)	Cost of Installing, Total	Total Received for Installing	No.	Connected Load (Kw.) Added	Kw.-Hr. per Year Added (Est.)	No.	Connected Load (Kw.) Added	Kw.-Hr. per Year Added (Est.)	Cost of Strengthening or Extending Since Total	Cost of Strengthening or Extending Since Per Range
A	8	58.4	16,400	$244	$140	21	126.1	43,000	29	184.5	59,400	$1,475	$50.75
B	46	316.4	82,700	856	540	35	214.3	63,000	81	530.7	145,700	9,089	112.00
C	15	105.0	27,000	75	70	..	.....	.....	15	105.0	27,000	.....	.....
D	4	31.2	6,000	.....	.....	10	83.5	15,000	13	114.7	21,000	354	27.20
E	18	135.9	33,600	42	42	32	203.2	60,000	50	339.1	93,600	1,606	32.10
F	104	693.5	180,440	1,398	1,085	65	462.6	112,000	169	1,156.1	292,440	7,567	44.75
G	6	43.0	10,500	155	155	2	11.5	3,500	8	54.5	14,000	293	36.60
H	17	123.5	40,800	254	175	22	159.2	53,000	39	282.7	93,800	1,515	38.80
I	38	283.5	64,300	1,374	1,085	36	259.4	61,000	74	542.7	125,300	3,210	43.40
J	14	92.2	29,428	412	377	39	293.7	82,000	53	385.9	111,428	3,315	62.50
K	2	14.7	3,500	.....	.....	..	.....	.....	2	14.7	3,500	1,323	661.00
L	21	185.7	37,800	735	610	23	180.4	41,000	44	366.1	78,800	298	6.77
M	56	436.4	105,682	2,148	1,295	16	80.4	30,000	72	516.8	135,682	8,506	118.00
N	3	19.0	4,440	.....	.....	2	6.0	3,000	5	25.0	7,440	.....	.....
O	0	.....	.....	.....	.....	..	.....	.....	..	.....	.....	.....	.....
Total.....	352	2,538.2	642,590	$7,693	$5,574	303	2,080.3	566,500	654	4,618.5	1,209,090	$38,551	$57.40
A	35*	186.5	65,800	$163	$140	5	37.6	.....	40*	224.1	.....	$102	$9.26
B	30	210.4	54,000	768	493	14	101.7	.....	44	312.1	.....	3,721	84.50
C	9	53.0	13,225	175	175	4	23.1	.....	13	76.1	.....	600	46.00
D	2	15.1	3,000	35	35	1	10.4	.....	3	25.5	.....	82	27.30
E	30	208.1	53,675	401	315	20	87.9	.....	50	296.0	.....	3,663	73.25
F	44	302.4	76,535	1,346	955	70	468.3	.....	114	316.4	.....	3,881	34.00
G	1	8.0	1,500	.....	.....	2	14.0	.....	3	22.0	.....	.....	.....
H	3	22.6	7,200	85	70	10	71.0	.....	13	93.6	.....	120	9.23
I	24	182.9	42,800	1,374	1,155	18	142.9	.....	42	325.8	.....	9,037	215.00
J	29	195.5	33,500	1,004	955	7	48.4	.....	36	243.9	.....	1,617	45.00
K	..	.....	.....	.....	.....	1	6.3	.....	1	6.3	.....	7	7.00
L	16	124.6	28,800	484	349	11	81.4	.....	27	206.0	.....	746	27.60
M	24	168.2	46,080	1,276	840	9	59.1	.....	33	227.3	.....	4,452	135.00
N	6	34.2	6,840	.....	.....	3	18.9	.....	9	53.1	.....	.....	.....
O	..	.....	.....	.....	.....	0	.....	.....	..	.....	.....	.....	.....
Total....	253*	1,711.5	432,955	$7,111	$5,482	175	1,171.0	298,000	428*	2,882.5	729,000	$28,028	$70.00

* Twenty-nine of these ranges were installed previously but not reported.

sales resistance, the company believes in maintaining the installation charge at a nominal figure and taking the deficit out of the range profit.

The cost of installing the ranges that were purchased installed was $14,804, whereas the total received for installation was only $11,056. This loss of $3,748 when spread over the 605 ranges sold (some of which were sold not installed) represents a loss of $6.20 per range sold.

Prior to 1925, when the collection of these data was started, the company had sold only 123 domestic ranges in the fifteen districts listed and the dealers 158 in the same territory. Because the company operates both gas and electric properties in a number of places, it is not strenuously pushing the electric range throughout its entire territory, although the same opportunities are afforded customers to secure ranges in one territory as in another. In District F, where the Consumers Power Company does not operate the gas property and where it has consequently been more energetic in range sales, it has observed that utility participation in merchandising of electric ranges stimulates the business of local dealers. This is indicated by the accompanying figures and is attributed partly to the public educational work, publicity and demonstrations by the company.

Recognizing that the Consumers Power Company will benefit most if the maximum number of domestic ranges are sold regardless of who sells them, and also recognizing that competitive dealers might be at a handicap if they were not provided with information regarding the policies and practices of the Consumers Power Company with regard to electric range installation, the company is co-operating with contractors and dealers by giving them such information. For example, it points out:

REGULATIONS AFFECTING RANGE INSTALLATIONS

The following procedure is in effect at the present time in connection with the installation of electric ranges. There may be, however, cases where it will be impossible to follow out exactly the same procedure as is outlined. It is therefore necessary that individual consideration be given to each application for the installation of an electric range, and before a sale is made to any consumer, our commercial department should be consulted, so that an investigation can be made of the situation. In this way any misunderstanding will be avoided and the fullest co-operation secured.

1. In case a present lighting customer desires to install an electric range, we will endeavor, within reasonable limits, to strengthen our lines where necessary, in order to furnish proper service for the range. This, however, cannot always be done, as cases may arise where the expense may be too great.

2. When it is necessary to construct an extension in order to furnish service to a prospective combined lighting and range consumer, we will, within reasonable limits, strengthen our lines up to the point of the extension and extend our secondaries two pole lengths for each combined lighting and range consumer. In cases where other construction may be involved our policy is to expend on construction work an amount up to three times the estimated annual revenue to be derived from the new consumer or consumers.

3. If the cost of constructing the extension for a prospective lighting and range consumer is greater than three times the estimated annual revenue to be derived, it will be necessary for the consumer to finance the extension by depositing with the company the total cost of the extension. The company will then refund to the consumer, over a period of five years, an amount or amounts in accordance with either of the two following plans: (a) $60 for each lighting consumer connected to the extension, or $180 for each combined lighting and range consumer, or (b) 40 per cent of the gross revenue received by the company from all new consumers connected to the extension.

The total amount refunded over the five-year period will not, however, exceed the amount of the original deposit.

4. In cases of electric range installations the service will consist of at least three No. 6 wires and the service box will be at least of 60-amp. capacity. The wiring from the service box to the range may consist of three No. 8 wires or three No. 6 wires, depending upon the capacity of the range. Where the range has fuses of its own, it will not be necessary to install a fuse box, but No. 6 wires must be run to the range. In cases where No. 8 wires are run to the range a fuse box must be installed.

5. Electric ranges, as considered under the foregoing regulations, must be the regular floor type and have a minimum capacity of 4,200 watts.

6. The following rate will be applicable to all combined lighting and range consumers: 9 cents net or 10 cents gross per kilowatt-hour for first 30 hours' use per month of active load; 6 cents net or 7 cents gross per kilowatt-hour for next 30 hours' use per month of active load; 3 cents net or 4 cents gross per kilowatt-hour for all over 60 hours' use per month of active load.

The capacity of the range is not included in the determination of the active load, which will result in the consumer, in many cases, being able to secure practically all of his range consumption at the low rate of 3 cents net per kilowatt-hour.

A record of present combined lighting and range consumers of the company shows that the average cost to the consumer for both lighting and cooking service is approximately $90 per year and the cost of cooking service alone is approximately $60 per year, or $5 per month.

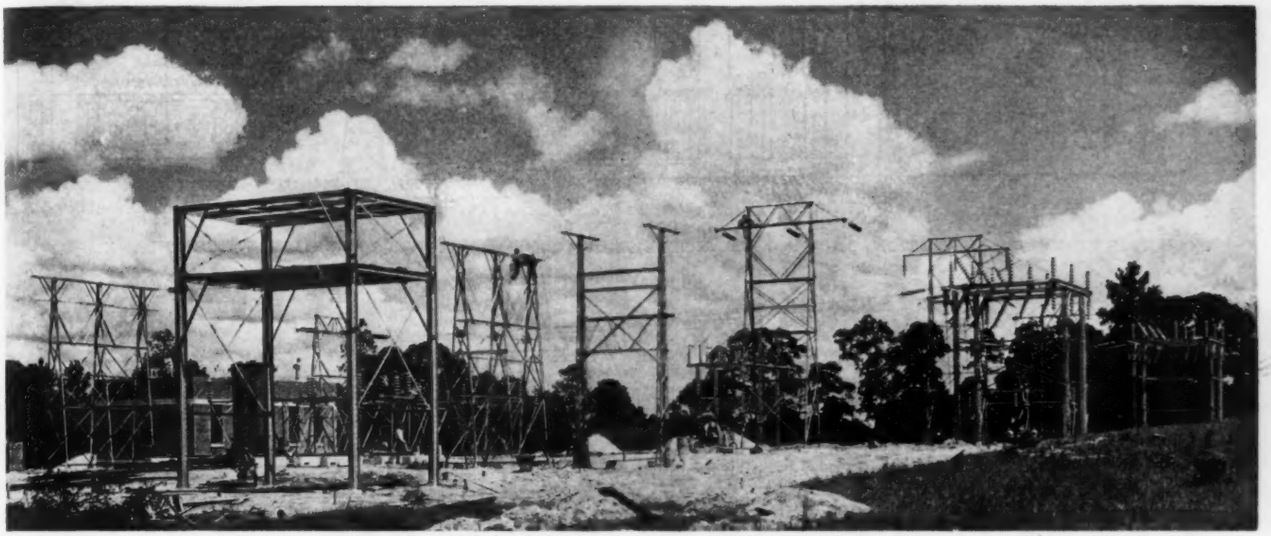
The foregoing information was furnished to the ELCTRICAL WORLD by W. H. Sammis, assistant to vice-president and general manager of the Consumers Power Company, Jackson, Mich.

Use of Colored Insulators

IN A RECENT issue of the *Journal of the Association Suisse des Electriciens* C. Burnier deals at length with the subject of the use of colored insulators in connection with electric transmission lines and expresses the opinion that coloring has no noticeable effect on the quality of insulators. He points out that the purpose of the enamel used on the surfaces of insulators is to provide a smooth, even surface which can readily be cleaned, as non-enameled porcelain, being never smooth, soon becomes a receptacle for dust. At first only white enamel was used, but in recent years a demand for colored insulators has sprung up, including chocolate, mahogany red, green, blue and pearl-gray.

Although porcelain is, M. Burnier points out, a vitreous material and the enamel is a glass applied to its surface, there is only a minute difference in their respective coefficients of expansion. An ordinary insulator consists of 98 per cent porcelain and 2 per cent enamel, so that the latter has but little influence on the electrical resistance of insulators, which are, as a matter of fact, more subject to deterioration by variations in temperature.

One reason why colored insulators are being more extensively used is to render them less conspicuous and consequently less liable to be the targets of stones and shot. Considerable difference of opinion exists, however, as to the color which renders insulators least conspicuous, and in the majority of cases the color selected depends simply on the preference of individual electrical engineers. M. Burnier considers that in hot climates colored insulators exposed to a storm after a hot day are more likely to suffer from violent internal reactions than white ones.



FLOMATON SUBSTATION, WHICH IS NOW UNDER CONSTRUCTION
Note use of unit type steel structures, eliminating massive box girder construction.

Construction of 110-Kv. Substations

Practical Standardization in Design on the System of the Southeastern Power & Light Company for Eleven New Substations on 450 Miles of 110-Kv. Lines

By L. M. SMITH and R. M. FERRILL
Engineering Department, Alabama Power Company, Birmingham, Ala.

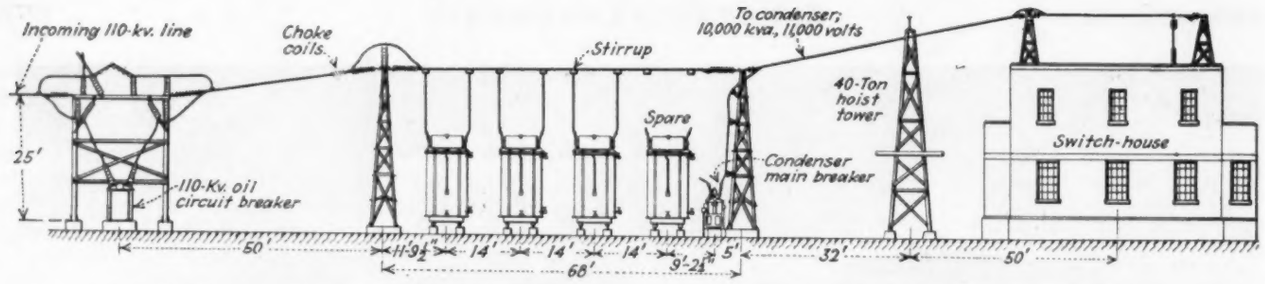
ONE of the many responsibilities that must be accepted by engineers and designers of high-tension substations that are to be built on long radial transmission lines to serve widely separated communities is properly to balance the capital investment against expected annual revenue. Before such a balance can be estimated it is necessary, of course, to make a careful study of present and prospective loads at each town to be served and to anticipate any unusual industrial expansion that may be expected. It is well to have also some idea of the natural resources of the various districts in order that their development may be fostered when adequate power becomes available.

Based on previous experience, the estimated operating expenses, taxes and carrying charges of the proposed new development must be considered along with the revenue possibilities before it can be determined whether the project is feasible; if not feasible at once, the year when it will be should be established. This does not mean that in every case extension of lines should be curtailed because temporarily unprofitable, for it is generally assumed that the utility is obligated to render adequate service where the customers are reasonably accessible to its facilities. Care should be exercised, however, not to increase the cost to serve existing customers on account of these extensions nor jeopardize stockholders' dividends by allowing the earnings to fall below a reasonable point.

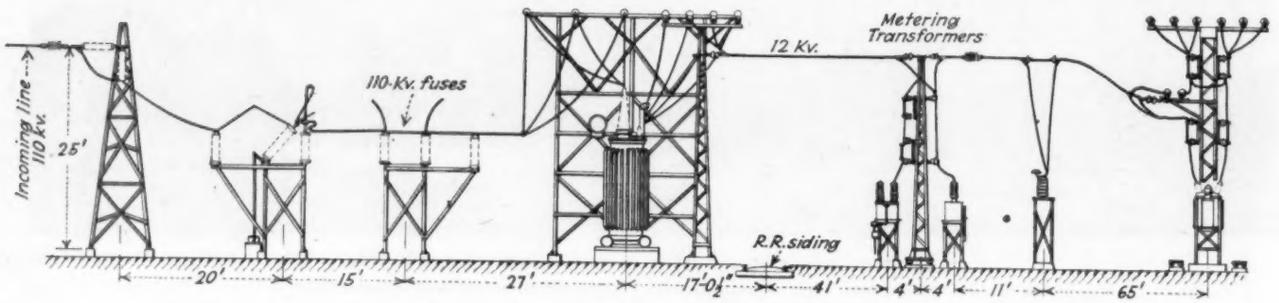
All of this requires close co-operation between the engineering, commercial and operating departments of the utility. These departments must study thoroughly many proposals and estimates. They must make certain that the service rendered on the project is dependable and adequate, that the initial cost of lines and substations is as low as practicable and that maintenance is lowered to the economical limit. Not until these and all the other factors have been taken into account to insure the success of the project should the approval of the management be requested.

On the basis of the plan just outlined there has re-

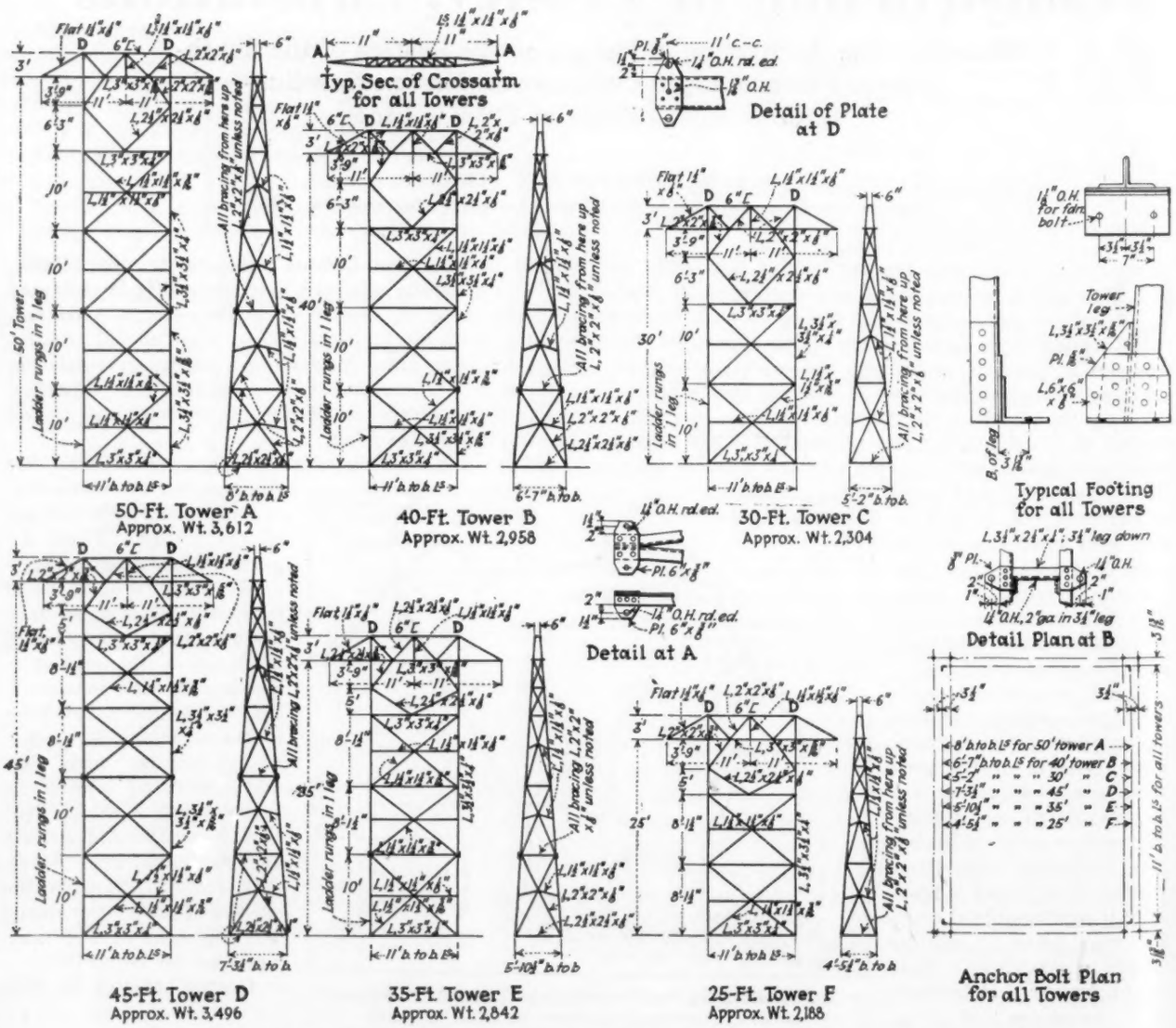
MAP SHOWING LINES OF SOUTHEASTERN POWER & LIGHT COMPANY SOUTH AND WEST OF LOCK 18 ONLY



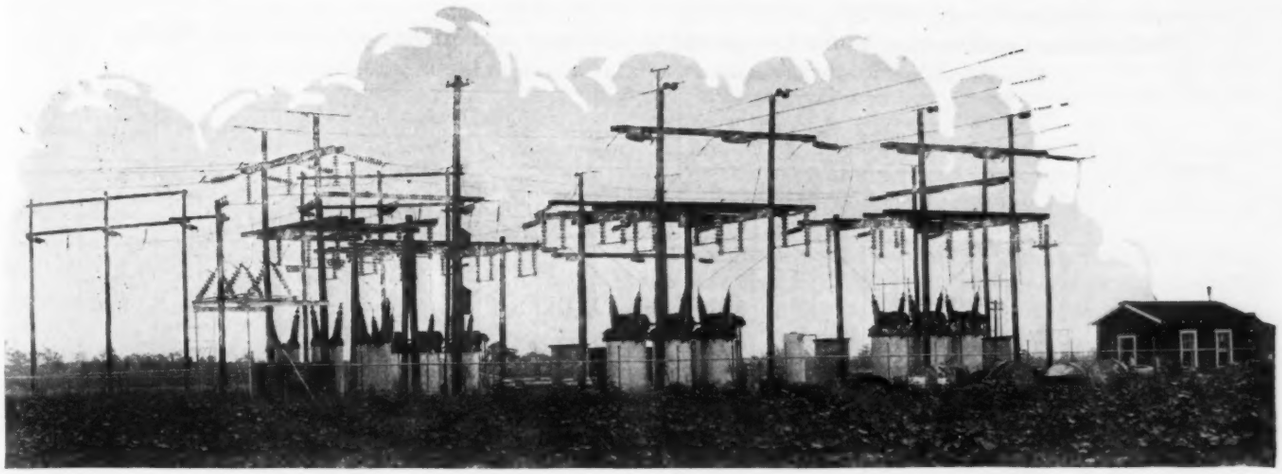
SECTION OF MOBILE SUBSTATION, SHOWING ARRANGEMENT OF TRANSFORMER BUSES FOR THREE-WINDING BANK



SECTIONAL ELEVATION OF PENSACOLA SUBSTATION, SHOWING ARRANGEMENT OF INCOMING LINE, TRANSFORMER BANK AND 12-KV. BUS


50-Ft. Tower A
Approx. Wt. 3,612
40-Ft. Tower B
Approx. Wt. 2,958
30-Ft. Tower C
Approx. Wt. 2,304
45-Ft. Tower D
Approx. Wt. 3,496
35-Ft. Tower E
Approx. Wt. 2,842
25-Ft. Tower F
Approx. Wt. 2,188
Typ. Sec. of Crossarm for all Towers
Detail of Plate at D
Detail at A
Typical Footing for all Towers
Detail Plan at B
Anchor Bolt Plan for all Towers
All bracing from here up L 2"x2"x⅛" unless noted
Ladder rungs in 1 leg

CONSTRUCTION OF TYPICAL 110,000-VOLT BUS TOWERS BEING USED FOR NEW ALABAMA SUBSTATIONS



LOCK 18 SUBSTATION, SHOWING TEMPORARY STRUCTURES NEAR SITE OF NEW HYDRO PROJECT

cently been added to the transmission system of the Southeastern Power & Light Company two 110-kv. lines having a total length of approximately 450 miles. Served from these lines are eleven primary substations ranging in size from 1,500 kva. to 18,000 kva., which with their major equipment are given in the accompanying table. The origin of the two lines is near the Lock 18 hydro site on the Coosa River, in Alabama, 16 miles downstream from the Mitchell Dam plant and 21 miles west of the new Martin Dam plant (formerly known as Cherokee Bluffs). One line extends generally westward across Alabama from Lock 18 to Selma, Demopolis and Cuba, thence to Meridian, Miss., and southwest to Stonewall, Laurel and Hattiesburg. The other line extends from Lock 18 generally southwest to Flomaton, Ala., from which point one line extends to Mobile and one to Pensacola, Fla.

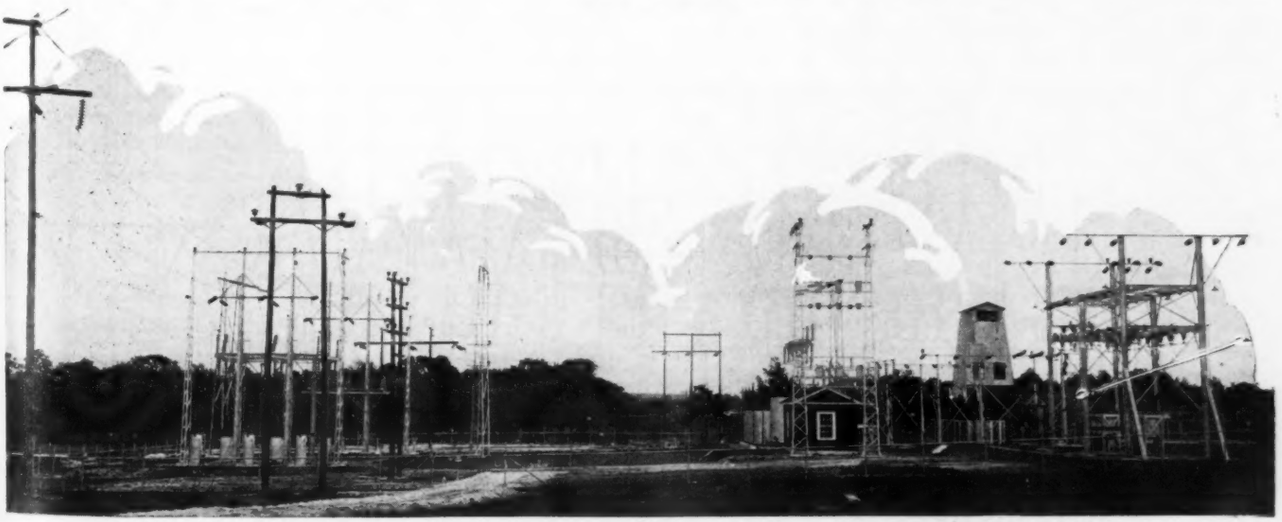
STANDARDS FOR MEDIUM-SIZED SUBSTATIONS

It has been found to be of distinct economic advantage to develop a standard practice for the construction of small and medium-sized high-tension substations on the system of the Southeastern Power & Light Company. The illustrations herewith show clearly the type of structures used as well as the extent to which construction practice has been standardized in order to reduce the investment to a point where the project could be considered feasible. A more complete description of the various practices follows:

Buildings.—Brick switch-houses, the architecture of which is applicable to buildings of different sizes, are constructed at all permanent stations where any considerable amount of control equipment is installed. These buildings are fireproof throughout and are of such size as to provide ample room for switchboard panels, communication equipment, battery and charger, etc., as well as space for the storage of spare parts. At attendant stations a locker room and washroom are provided also.

Operators' cottages are of four and five-room brick veneer construction complete with heating plant, water and sanitary conveniences. An exception to brick construction was made at Pensacola, where both switch-house and cottages are of stucco exterior, slightly tinted.

Buses and Bus Structures. — Steel towers similar to the conventional transmission line towers are used for practically all 110-kv. bus-supporting structures. The elevation of these buses in stations is only 25 ft. above ground, which is somewhat lower than usual American practice. The use of massive box girder construction has been eliminated and the number of insulators reduced to a practicable minimum. However



DEMOPOLIS SUBSTATION, SHOWING CARRIER CURRENT COUPLING ANTENNA AND PROTECTIVE EQUIPMENT

Substation Construction Work Completed in Alabama and Mississippi Since Last Spring

Major Equipment in Primary Substations on Lock 18, Hattiesburg, and Lock 18, Mobile-Pensacola Lines

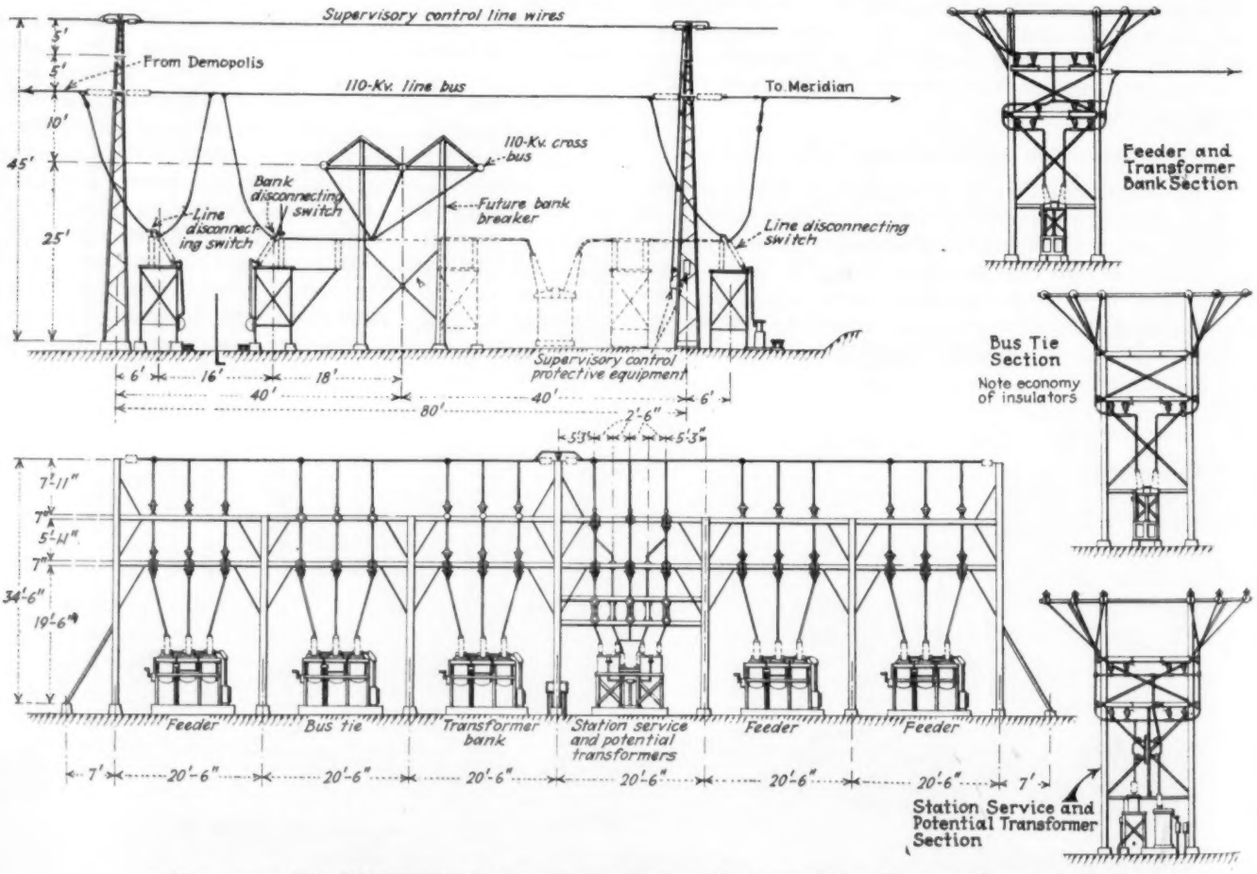
Substation	Transformers*					Oil Circuit Breakers						Switch Board		Synchronous Condenser	
						High Tension			Low Tension						
	No.	Voltage, Kv.	Connection	Capacity in Kva. of Each Transformer	Mfr.	Kv.	Interrupting Capacity in Kva.	Mfr.	Kv.	Interrupting Capacity in Kva.	Mfr.	No. Panels	Mfr.	Kva.	Mfr.
Lock 18	0	.....	...	.....	.....	115	1,000,000	G. E.	..	.....	.....	4	West.	.....	.....
Selma	4	110 to 45	†	1,500	West.	...	.....	G. E.	50	250,000	West.	7	G. E.	.....	.....
Demopolis	3	110 to 45	†	2,500	Al.-Ch.	110	450,000	G. E.	50	250,000	West.	7	G. E.	.....	.....
Cuba	3	110 to 45	†	500	G. E.	...	.....	.....	50	150,000	West.	3	G. E.	.....	.....
Meridian	4	110 to 12	‡	2,000	G. E.	110	450,000	G. E.	25	433,500 at 15 kv.	G. E.	8	West.	5,000	Al.-Ch.
Stonewall	3	110 to 45	†	1,500	West.	...	.....	.....	..	.....	.....	..	.....	.....	.....
Laurel	4	110 to 12	§	2,000	.....	...	.....	.....	37	500,000	Condit	3	West.	.....	.....
Hattiesburg	4	110 to 12	§	2,000	G. E.	...	.....	.....	25	433,500 at 15 kv.	G. E.	6	West.	5,000	Al.-Ch.
Flomaton	3	110 to 45	†	1,500	West.	110	500,000	G. E.	44	150,000	West.	9	West.	.....	.....
Pensacola	4	110 to 12	§	2,000	G. E.	...	.....	.....	25	250,000 at 15 kv.	G. E.	8	West.	5,000	West.
Mobile	4	110 to 22 to 11 Three-winding	°	5,000; 6,000; 3,300 Water-cooled	Al.-Ch.	115	500,000	G. E.	25	455,000	West.	9	G. E.	10,000	Al.-Ch.

* All transformers self-cooled unless otherwise specified. † Delta-delta. ‡ Y-delta. § Delta-Y. ° Y-Y-delta.

good, every insulator must be considered a hazard and unnecessary steel work is needless expense. Low-tension switch structures are so designed that few or no insulators other than those on the disconnecting switches are required between oil circuit breakers and the bus or line.

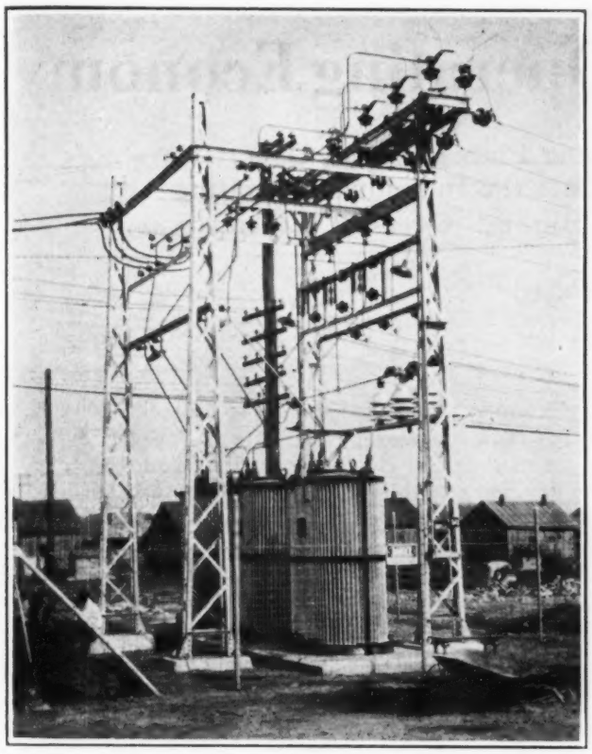
Switching and Protective Equipment.—On all frequently used disconnecting switches, gang operation is employed on both the 110-kv. and low-voltage circuits. At non-attendant stations the operation of 110-kv. switches is accomplished through motor mechanisms operated by the supervisory system. The physical arrangement of all gang-operated switches is such that for connections no insulators other than those on the switch are usually required. Bypass disconnecting switches are installed on all feeder and transformer bank oil circuit breakers, thus allowing for regular or emergency inspection without interrupting service.

Transformer banks are protected on the 110-kv. side by specially designed fuses, which may be replaced in a very short time. These fuses are of such size as to blow only for transformer trouble. The arrangement of the transformers and their buses is such that a faulty transformer may be taken out of service and the spare put



110-KV. LINE BUS AND SWITCH GEAR IN CUBA SUBSTATION AND TYPICAL 44-KV. BUS STRUCTURE

In the illustration at upper left the dotted lines show arrangement of future bank breaker and its disconnecting switches, upon installation of which the original bank of disconnecting switches becomes a breaker bypass switch



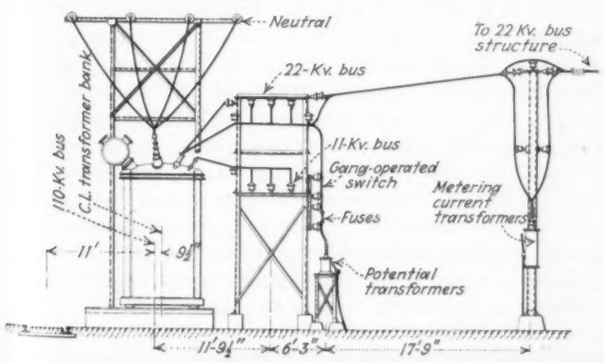
LAUREL STEAM PLANT SUBSTATION CONNECTING WITH 110-KV. PRIMARY SUBSTATION

in (or only a faulty transformer cut out, where open-delta operation is possible) with the shortest possible interruption to service and without moving any transformers on their foundations.

Lightning arresters are not considered necessary in the 110-kv. circuits, although choke coils are installed ahead of transformers for what surge protection they may afford. Low-voltage arresters are installed on the buses and in a few cases also on the low side of the bank.

Communication and Supervisory Control.—Antenna coupled power line carrier current is provided for inter-station and system communication in all of the stations described. In some of the stations still under construction it is possible that coupling will be made through condensers. For supervisory control the audible type medium frequency system is installed. The zones for control are shown in an accompanying diagram.

Miscellaneous.—A grounding system of standard practice has been installed at each station. This system has a minimum of three field ground so that periodic tests of ground resistance may be made.



CURRENT AND POTENTIAL TRANSFORMERS IN MOBILE SUBSTATION

At all stations a two-line oil-piping system with a large-capacity oil storage tank is provided. Hose fittings are located near the driveway so that the company's filter truck can be connected for filtering the oil in any piece of equipment.

All low-tension feeder breakers are automatic reclosing on the three shot lockout cycle. A lockout indicates serious trouble that must be corrected before the breaker can be put back into service.

In addition to the foregoing, standardization of practice has been made and standard plans and specifications have been prepared for such other details as transformer hoist tower and transfer cars, fencing, septic tanks, insulating platforms, bus terminal and tap connections, connection diagrams for bushing type current transformers, insulator assemblies, concrete and brick work and painting. It has been found that these practices have greatly reduced the number of new drawings to be made and has resulted in more uniform construction workmanship. Special requirements prevent, of course, the building of all stations from the same set of plans, for regardless of standardization there still are many individual problems that must be solved for each specific job.

Electric Power Transmission in France

THE French government has recently granted a concession for the establishment of two new electric transmission systems in the Department of Haute Garonne. One of these systems will connect the two hydro-electric stations of the Société Valentinoise—one at Las Nodes, already in operation, and one to be constructed at Valentine on the River Garonne—with the Mancioux hydro-electric station of the Société des Forces Motrices de la Garonne and one between the last-named plant and the electrochemical works at Boussens. The first line will transmit 50-cycle current at 60,000 volts to a transformer station, where it will be stepped down to 15,000 volts. The second line will comprise two 25-cycle, single-phase, 5,000-volt circuits, a 15,000-volt, 50-cycle, three-phase circuit and a 3,000-volt, 50-cycle circuit.

Extensive Power Project Planned for Malay State

An extensive hydro-electric project has been planned for the state of Perak, which is situated along the west cost of the Malay peninsula, according to the Electrical Equipment Division, Department of Commerce. A company, entitled the Perak River Hydro-Electric Power Company, has been formed to supply the power requirements of the district to be served. This company has secured an 80-year concession covering an area of more than 3,000 square miles. Perak contains deposits of gold, silver, copper, mercury and other minerals, and power requirements of approximately 97,000,000 kw.-hr. a year have been confirmed by 72 of the more important mines operating in that region. It is estimated that energy for lighting will utilize about 3,000,000 kw.-hr. more per year. The construction work on this project is estimated to extend over a period of three years. It is stated that the total cost will be about £2,320,000 and that the net earnings are expected to be £382,600 per year. The government of the Federated Malay States and the British government will aid in financing the enterprise.

Unifying System for Operating Economy

Southern California Edison Company Places System Operation Under One Head so as to Co-ordinate the Individual Operating Interests and Thus Obtain the Highest Over-All Efficiency

By J. W. ANDREE
Production Engineer Southern California Edison Company, Los Angeles, Cal.

THE problem of operating a system as large and with so many variables as that of the Southern California Edison Company at a maximum over-all efficiency requires a great deal of study and planning. The operating personnel of both steam and hydro-electric plants are always striving for the highest possible efficiency in their respective plants and are always anxious to operate under conditions that will allow them to accomplish this result. However, such conditions do not always result in the best system economy. This company has recognized the importance of obtaining the maximum system economy and has placed this phase of the operation under one head not directly connected with any other department and in a position to operate the system impartially in a manner that will result in maximum over-all efficiency.

The magnitude of the problem may be better appreciated when the physical characteristics of the system of the Southern California Edison Company are considered. The company has four steam plants with a total capacity of 201,600 kw. and twenty hydro-electric plants with a total capacity of 347,600 kw., making a total generating capacity of 551,200 kw. It serves a territory of 55,000 square miles and has 83 attended substations, 151 unattended substations, 546 circuit-miles of 220-kw. lines, 1,537 circuit-miles of 60-kv. lines, 83 circuit-miles of 30-kv. lines, 842 circuit-miles of 15-kv. lines, 4,020 circuit-miles of 10-kv. lines, 3,300 circuit-miles of 4 and 2.2-kv. lines, and 25 synchronous condensers with an aggregate capacity of 291,000 kva.

The operating economy of the units in the steam plants varies inversely as the age of the units and ranges from 30,000 to 15,000 B.t.u. per kilowatt-hour. Of the hydro-electric plants 89,600 kw., or 26 per cent of the total hydro plant capacity, has no water storage facilities and cannot regulate the flow of the rivers; 90,000 kw., or 26 per cent, has limited storage, which permits drawing on the small reservoirs for peak loads, regulation or economical loading of units; 86,000 kw., or 25 per cent, has storage facilities of capacity sufficient to accumulate the river flow during low-load period of the day and use this during the heavy-load period, and 82,000 kw., or 23 per cent, has full seasonal storage facilities.

There is a wide seasonal fluctuation of flow of the streams in central and southern California on which this company's hydro-electric plants are located, as is shown by Table I. The fuels used in the production of steam power are fuel oil and natural gas. The natural gas is surplus gas above requirements for domestic or other uses; therefore, as an inducement for the company to use this surplus gas and prevent its being wasted, a price is made to it that is somewhat below the cost of oil fuel. Table I shows the amount of this surplus gas fuel available each month of the year in per cent of the total and also the total load expressed similarly.

TABLE I—CHECKING POTENTIAL POWER-PRODUCING RESOURCES AGAINST SYSTEM DEMANDS

Month	Monthly Discharge of Streams in per Cent of Total Annual Discharge	Surplus Gas Fuel Available in per Cent of Total Annual Available Supply	System Load in per Cent of Total Annual Load
January	2.5	2.7	6.9
February	3.5	4.7	6.7
Mareh	5.0	6.1	8.0
April	14.2	8.1	8.2
May	25.2	10.2	8.8
June	27.5	10.8	9.0
July	12.2	11.5	10.0
August	3.5	11.8	9.8
September	1.8	10.4	9.2
October	1.5	9.5	8.3
November	1.3	8.1	7.8
December	1.8	6.1	7.3
Total	100.0	100.0	100.0

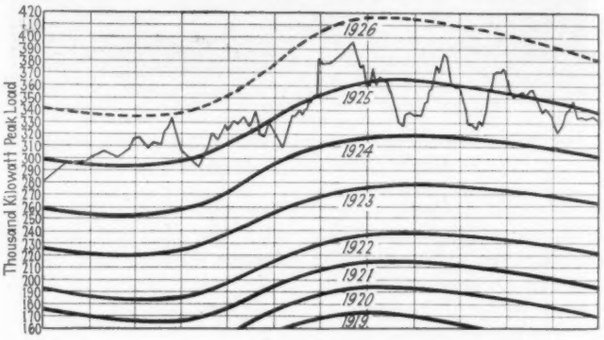


FIG. 1—METHOD OF ESTIMATING PEAK LOADS A YEAR IN ADVANCE

Each week's peak load is plotted and a smooth curve drawn as shown for the year 1925.

Load records from all generating plants and important substations are kept. For purpose of estimating peak loads a year in advance the maximum peak of each week is plotted in curve form as shown in Fig. 1. Then an average smooth curve is drawn through these points as illustrated for the year 1925. The actual peak loads may vary about 10 to 15 per cent above or below this average, but these variations are due to conditions that could not have been foreseen, hence the average curve is the most reliable to use for estimating purposes. With a series of such curves established, a percentage increase for each month is easily calculated and a curve of peaks for following years derived. Fig. 2 shows the method used for estimating the load in kilowatt-hours for each month. Here the curve for each month is extended for another year to obtain the estimate. The location of points off the smooth curve of

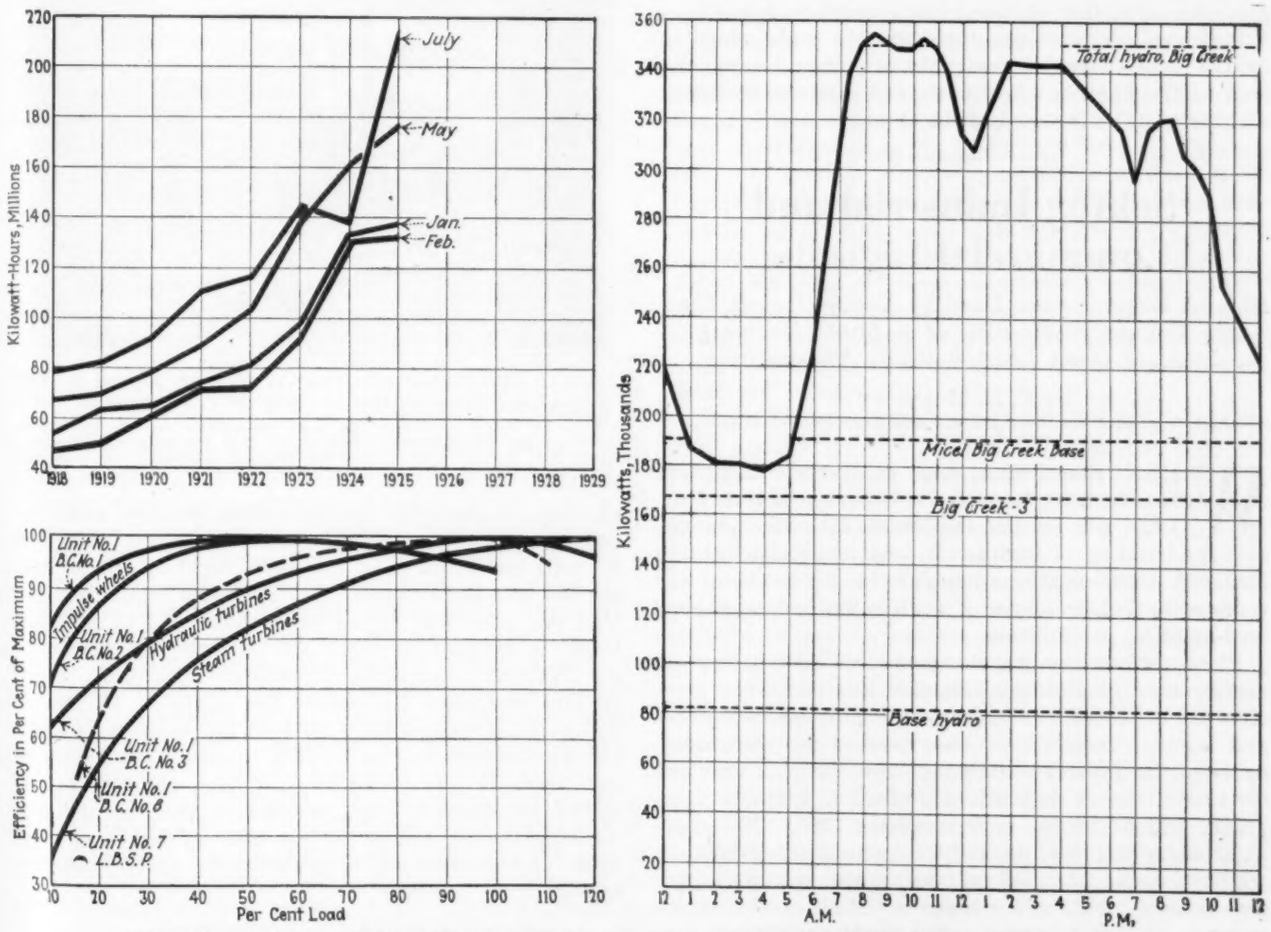
TABLE II—POWER RESOURCES OF SOUTHERN CALIFORNIA EDISON COMPANY APPLIED TO 1925 ESTIMATED LOAD

Month	Base, Kw.-Hr.	B. C. No. 3 Base, Kw.-Hr.	Shaver and Miscellaneous B. C. Base, Kw.-Hr.	Upper San Joaquin Base, Kw.-Hr.	Storage Hydro, Kw.-Hr.	Steam and Purchased, Kw.-Hr.	Total, Kw.-Hr.
January	34,048,700	14,000,000	2,620,000	0	15,544,632	72,208,870	138,422,202
February	40,814,000	33,850,000	18,460,000	0	7,746,943	33,466,128	134,337,071
March	57,610,000	56,850,000	17,500,000	0	8,000,000	23,800,000	163,760,000
April	61,990,000	52,080,000	23,800,000	15,130,000	0	4,000,000	157,000,000
May	63,940,000	56,700,000	27,860,000	11,500,000	0	3,000,000	163,000,000
June	59,250,000	59,280,000	12,400,000	36,070,000	0	2,000,000	169,000,000
July	58,460,000	62,540,000	5,500,000	48,000,000	0	11,000,000	185,500,000
August	53,360,000	40,800,000	1,700,000	52,100,000	22,040,000	25,000,000	195,000,000
September	36,840,000	19,550,000	1,350,000	23,000,000	50,000,000	44,000,000	174,740,000
October	37,240,000	16,700,000	1,350,000	14,900,000	49,810,000	45,000,000	165,000,000
November	34,330,000	14,750,000	1,350,000	7,200,000	53,370,000	44,000,000	155,000,000
December	37,240,000	20,100,000	1,900,000	4,500,000	41,260,000	45,000,000	150,000,000
Total	575,122,700	447,200,000	115,790,000	212,400,000	247,771,575	352,474,998	1,950,759,273

increase are due to causes known to the operator and are discounted accordingly in the estimate of future load. Due to the very dry season in 1924, all points for 1925 were off the smooth curve. July of 1925 is too high due to the sale of a large block of surplus power.

Table II shows power resources applied to the 1925 estimated load. Preliminary estimates for the year are made about April 1, at which time usually about 90 per cent of the season's precipitation has been realized and fairly close estimates of the seasonal run-off can be made. The storage water of Huntington Lake is used through four power drops totaling approximately one mile and each acre-foot generates about 4,250 kw.-hr. The water available from Huntington Lake is not sufficient to operate the Big Creek plants at full load all the time, but there is always sufficient water to pull full load at peak time, which permits operating steam turbines at block load during certain seasons and taking the regulation on the Big Creek plants. The water used through the Big Creek plants has such high power-producing value that very careful estimates are made of the water available for each of these plants and the use of this water is scheduled so as not only to produce the largest number of kilowatt-hours but also to replace energy which if generated by other plants would have higher cost.

Average daily load curves are plotted (Fig. 4), one for each month. These curves are increased by a percentage equal to the increase of the load and therefore



FIGS. 2, 3 AND 4—GRAPHICAL RECORDS OF DAILY AND YEARLY LOADS ON SYSTEM WITH CURVES SHOWING EFFICIENCIES OF STEAM AND HYDRO UNITS

Top, left—Estimating load in kilowatt-hours from year to year. Each month's load is extended another year to obtain estimate. Bottom, left—Relative efficiencies of steam and hydro units used in determining most economical units to operate.

Right—Average daily load curve for month of June. To this curve is added the percentage of increase over the preceding year, which gives the estimated load for the corresponding month for a year in advance.

represent an average curve for the coming year. As the base hydro cannot be varied, it is given a block on the lower area of this curve. Superimposed on this is the Big Creek No. 3 plant, which will have sufficient water for full load for the month shown (June). During this month the flow of the upper San Joaquin River will also be sufficient so that enough water will be available to operate the upper Big Creek plants at full load. This brings the hydro capacity up near the top of the load curve, and about all that is left for the steam plants is to carry the extreme peak and the system regulation. For other months the power available from stream flow hydro plants is much less and there is a large area between this and the top of the load curve that must be carried on steam or storage hydro power. The process of arriving at the proportion of steam and storage hydro power to be carried each month is largely a matter of cut and try until conditions are obtained that use the largest possible amount of the cheapest fuel and at the same time allow the largest steam production on the most economical units.

As shown in the case of the steam turbine plant the efficiency increases directly as the load increases even for points above rated capacity and that the decrease in efficiency is rapid below 90 per cent load. The hydraulic turbine efficiency decreases rapidly when 100 per cent load is exceeded and the drop in efficiency on decreasing loads is not as rapid as that of the steam turbine unit. The impulse waterwheels have their maximum efficiency at about 55 per cent load and have a high relative efficiency throughout a wide range of load. It is therefore desirable to carry the varying load on the impulse wheel units and give the hydraulic turbine units an economical block load.

Selling Industrial and Commercial Lighting

Plan of Organization Used by Pacific Gas & Electric Company—Results of a Short Campaign Indicate Good Load-Building Possibilities

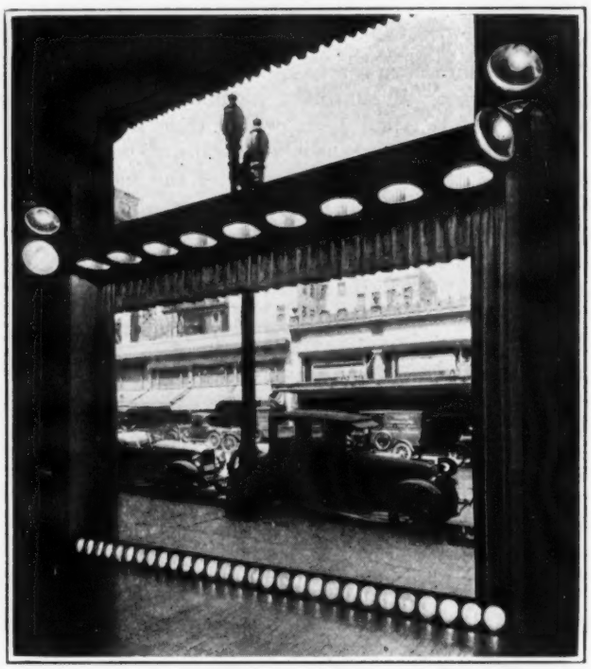
BY C. D. MONTEITH
Lighting Sales Engineer Pacific Gas & Electric Company, San Francisco, Cal.

WHEN the Pacific Gas & Electric Company launched its intensive sales campaign in July, 1925, one of the important activities planned was the building of commercial and industrial lighting load. A three-months campaign in 1923 which was confined to the city of San Francisco had indicated good load-building possibilities.

Plans for the campaign consisted of selling lighting service through lighting salesmen located in the principal towns served by the company. The sale of fixtures and wiring installations was handled by contractor-dealers. On industrial lighting sales the plan provided for tieing in with the National Industrial Lighting Campaign, which started in September, 1925. The character of lighting load desired was general store lighting, window, display case, floodlighting and electric signs; also general lighting for manufacturing plants, shops, garages and warehouses. The lighting service rendered provided for recommendations as to the best type of lighting adapted to the customers' requirements and, where necessary, actual specifications.

One of the principal problems was the securing of salesmen. Only four experienced lighting men being available, due to the demand existing in other sales activities, notably in the Kitchen Lighting Campaign, a lighting school was formed in Oakland and conducted over a five-day period. This school, in addition to stressing the fundamentals of illumination, thoroughly covered practical applications.

Lighting bureaus in the six geographic divisions of the company were organized according to sales possibilities and sales quotas were set. The total quota for eighteen salesmen and two sales supervisors was set at 1,500 kw. for the last four months of 1925 and at 3,840 kw. for the year 1926. During the first period mentioned actual sales amounted to 1,577 kw. and for the first quarter of 1926 1,575 kw. of new lighting load had been added. The average kilowatt-hours per year per



LIGHTING ARRANGEMENT IN DISPLAY WINDOW WHICH PACIFIC GAS & ELECTRIC COMPANY PERMITS ITS CUSTOMERS TO USE

Various color combinations and intensities up to 150 foot-candles may be obtained. This is one of three windows which customers are allowed to use for display purposes for a period of seven days.

kilowatt of connected load for store, window and sign lighting business is 1,245 and the revenue $59 per kilowatt per year. For industrial lighting the figures are 880 and $22 respectively. The sales production per man per year was found to be from 180 to 480 kw. In the accompanying table will be found the results of the National Industrial Lighting Campaign. Sales quotas have been figured on the basis of 15 kw. to 20 kw. of increased lighting load per man per month. During the first quarter of 1926 salesmen have actually sold from 15 kw. to 50 kw. per man per month. It should be noted in this connection that quotas and commissions are figured on the basis of increased kilowatts of lighting load; in other words, strictly creative sales.

SALESMEN'S COMPENSATION

Salesmen's compensation was figured on a salary plus commission basis. Salary amounts to $150 per month with a commission of $1 per kilowatt of increased

lighting load. These increases in lighting loads fall under the following classes:

1. All commercial business and industrial establishments already receiving lighting service.

2. All new commercial business and industrial establishments contemplated, either under construction or unoccupied. The wattage increase secured, over and above that specified in building plans, will be taken as the basis for figuring the commission.

3. Previously occupied and recently vacant store buildings or industrial plants now being purchased or leased in which the lighting salesman secures a lighting installation calling for changes in wiring, outlets and fixtures which require a greater wattage than that existing at the time the new tenant leased or purchased the premises.

The payment of commissions is based upon completed installations and is made once a month. A printed form is used which shows the recommendations made by the lighting salesmen, indicating the wattage of the old and new installation. This statement the salesman asks the customer to sign. One of the disadvantages of this scheme of compensation is the necessity of checking increased lighting load upon which commissions are paid. The company feels, however, that this disadvantage is offset by the advantage that the salesman's earnings depend partly upon his production efforts.

RESULTS OF NATIONAL INDUSTRIAL LIGHTING CAMPAIGN BY PACIFIC GAS & ELECTRIC COMPANY

Sept. 1, 1925–March 31, 1926	No. Jobs Sold	Total Value Wiring and Fixtures	Kw. Load Increase
San Francisco	87	$28,881	371
Oakland	56	5,700	146
San José	42	10,665	158
Sacramento	6	699	16
San Rafael	5	250	11
Marysville	7	599	22
	203	$46,794	714

Sales supervisors are provided only for the lighting bureaus, where four or more salesmen are employed. Among the duties of the sales supervisors are the following:

They direct surveys of business and industrial territory and provide prospect cards for salesmen; check salesmen's proposals to customers; advise salesmen in customer-electric dealer relations; obtain contact with active manufacturers' representatives, jobbers and contractor-dealers and secure their co-operation; arrange frequent sales talks before salesmen by manufacturers' representatives or jobber lighting salesmen; check the increase in wattage of each installation changed as a result of this sales campaign, and maintain an accurate record of sales accomplishments.

In the larger cities salesmen are assigned districts. In San Francisco each salesman has two districts, one in the downtown main business section, the other in the outlying business or industrial sections. This arrangement is made to provide equalization of territory.

Prospects are secured from daytime and evening observation and at demonstration talks given before business men and merchants' associations. The names of additional prospects are secured from other companies and electric salesmen. These names of prospects, together with facts concerning the installation, are listed on cards provided.

Advertising consists principally of broadsides and circular letters mailed direct to customers. The advertising provided by the National Industrial Lighting Campaign was used with satisfactory results. The large red and green colored broadsides, supplied by the Society for Electrical Development, were mailed to commercial lighting customers.

Full co-operation with manufacturers, jobbers and contractor-dealers is carried on. Lighting salesmen worked with the sales representatives of these concerns. Great care is exercised that the salesmen use tact and fairness in recommendations made to customers covering the equipment and contractor-dealer firms for making the installation. In general, contractor-dealers in the business district who regularly do the customer's work are favored. Records are kept in some of the divisional lighting bureaus showing the number, type of equipment and firms making the installation as well as the cost of wiring and fixtures. These statistics are of value in showing the distribution of lighting business to dealers.

COMMERCIAL LUMINAIRES SALES

Selling efforts disclosed in some cases that changes in lighting installations could not be carried out by customers desiring to make such changes, due to the expense involved. To meet this situation, the company undertook the sale of one line of commercial luminaires. These were provided in both the suspension and the ceiling types and in sizes of 200-watt 14-in., 300 and 500-watt 16-in. and 750-watt 18-in. fixtures.

As the company's policy is one that favors the merchandising of electrical equipment through contractor-dealers and other trade channels, the selling plan was built to permit the contractor-dealer to earn a very liberal installation fee, which actually included what was equivalent to a merchandising profit. Unit costs were determined in arriving at selling prices and term payments of $1.50 per month per luminaire were asked.

The advertising used consisted of direct-by-mail broadsides, the first two of which were the red and green broadsides before mentioned, mailed with the thought of arousing the prospect's interest in consideration of his lighting problem, and these were followed with a broadside illustrating the luminaire and setting forth the offer.

The number of these units sold so far is satisfactory considering the manner in which the sales were undertaken, it being not a campaign to show how many could be sold, but rather a means for providing better lighting service where installation costs were the principal sales resistance.

In some cases it has been found that the same luminaire is offered at a lower cost by contractor-dealers. Where such instances occurred, salesmen thereafter advised the customer that in case he could pay cash the same equipment could be purchased through contractor-dealers at a more advantageous figure than the price the central station could quote.

The company installed a most modern window-lighting installation in its offices in San Francisco. In each of three 16-ft. windows there are 500-watt reflectors on 18-in. centers, twenty-nine 150-watt disappearing footlights on 9-in. centers and four 500-watt floodlights mounted in the upper corners. The arrangement of lights in one of these windows is shown in the accompanying illustration. To interest its customers and demonstrate the benefits of high-intensity window lighting, the company offers the use of these windows

to its customers for a seven-day period. Not only is much attention attracted to the displays from the passers-by but very favorable results have been secured in efforts to sell high-class window lighting installations to merchants.

Letters from Our Readers

Radio and Light Transmission

To the Editor of the ELECTRICAL WORLD:

In the article "Conjectures and Speculations" (ELECTRICAL WORLD for Aug. 21, page 378) the author endeavors to prove that radio and light transmission occur through the material medium air. This proof is destroyed by one experimental fact, namely, that light and radio energy (electromagnetic waves) are transmitted through space which does not contain air. Whether the space contains any other medium is a point for conjecture.

The analogy of earth resistance to air resistance is illogical. In either case the resistance of the entire medium is of little importance; it is the resistance of contact with the medium at the points necessary for transfer that determines the resistance. The resistance between a point and a 100-mile sphere of air is practically infinity, for we have the resistance offered between the surface of contact of a point and the air surrounding that point, all in series with the rest of the circuit whose resistances may be expressed in ohms with a number containing an infinite number of zeros.

North Hibbing, Minn. ABE BENESOVITZ.

Opposes the Grounding of Secondaries or Transformers

To the Editor of the ELECTRICAL WORLD:

At the risk of being considered a back number, I would like to see comments by men of experience for and against the practice of grounding transformers and the grounding of secondary systems. I have personally had a decided aversion to this practice, and in twenty-five years' experience in the electric business I have not had a serious accident from non-grounded transformers or secondary circuits. It is my personal opinion that there is less danger of high-voltage energy coming in on the secondaries than there is from low-voltage grounded systems, as the possibility of high-tension current on the low-tension side as against trouble of other kinds on the low-tension side is possibly in the ratio of one to five thousand or more.

The serious accidents through contact with low-tension wiring can, I believe, in most cases be traced to the grounding of the secondaries. From the linemen's point of view—and there are more linemen killed than customers—grounding of transformers, I believe, only adds an extra hazard to men on the line. However, I am willing to learn from higher authorities, and as there are others like myself who do not look with favor on the grounded system, I believe it would be an interesting subject for discussion. I further believe that concentration on better line construction, making the systems more easily inspected and kept in condition, would be more effectual than regulations for grounding, which in most cases do not mean effectual grounding.

X. Y. Z.

A Defense of Public Utility Service and Public Utility Employees

To the Editor of the ELECTRICAL WORLD:

In the Sept. 18 issue of the ELECTRICAL WORLD you carried a letter written by T. E. Wilson that reflects on the public utility systems of the country. As an employee of a public utility I resent Mr. Wilson's attack on public utility employees and upon the public utility system. Knowing the public utilities, I can appreciate the fact that there are times when the utility company may not be in position to grant immediate service and when as a consequence the unthinking public heaps abuse on the employees who are undoubtedly working overtime to try to satisfy the company's customers.

Go into an electric generating station and note the demand made on the generating apparatus during the maximum peak load and compare that load with the minimum requirements; then think of the reserve capacity standing by or under repair. So much for the station. Go into the district office and compare the maximum service demand due to the foolishess of our good American people on or about May 1 and other habitual moving days. Now compare that demand with ordinary days when no emergency requests are made. If Mr. Wilson were a central-station executive, would he carry on his yearly payroll the number of employees necessary for immediate service on May 1?

Electricians are not made over night. The writer has been in the field for a number of years, and each year he realizes more keenly how great the industry is in comparison with his accumulated knowledge. Mr. Wilson is quite right when he remarks about the smaller salaries paid, but the work is never seasonal. Seniority, trustworthiness and ambition are recognized in our public utilities more than in any other place, and I "make no bones" about this, for I have within the past few months received from outside companies, without any initiative on my part, bona-fide offers as high as 25 per cent more than I am receiving. One may find minor officials who are irresponsible, but there is always recourse to higher ones, and I am sure that the very great majority have the same spirit as the writer and are willing to work day and night to provide service.

It is the unspoken motto or slogan of the utility that "the customer is always right." That slogan means and implies service. That slogan drives our engineers and linemen to superhuman service to keep the faith. Upon that slogan is based the drive for efficiency that every executive must show for promotion, and very few fail. Co-operation on the sales end receives the attention it deserves even to the point of carrying well-trained salesmen to get more business, though it would be hardly fair to give more attention to private enterprises than is accorded in one's own organization.

The writer grants that Mr. Wilson may have a just complaint, but it is hardly fair to look down upon our financial income. We have not mortgaged our souls or sold our self-respect to obtain our position. If we can do better in other positions, there must be a big reason for our remaining with employers who acknowledge our efforts. There is more to life than mere money, more to a job than mere work, and more to an employer than the majority of "outsiders" appreciate. Loyalty has rewards—and chiefly in the public utility company.

E. J. MORRISSEY,
Chief Electrician.

Western United Gas & Electric Company,
Aurora, Ill.

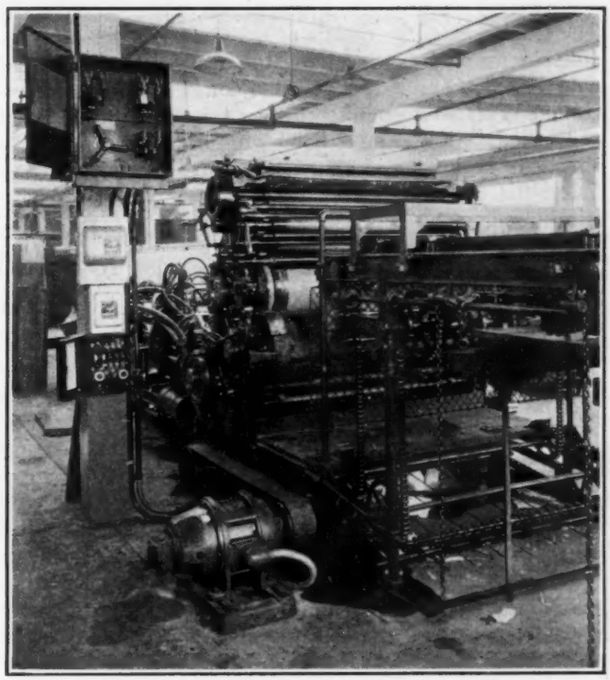
Central Station and Industrial Practice

Control of Printing Machinery

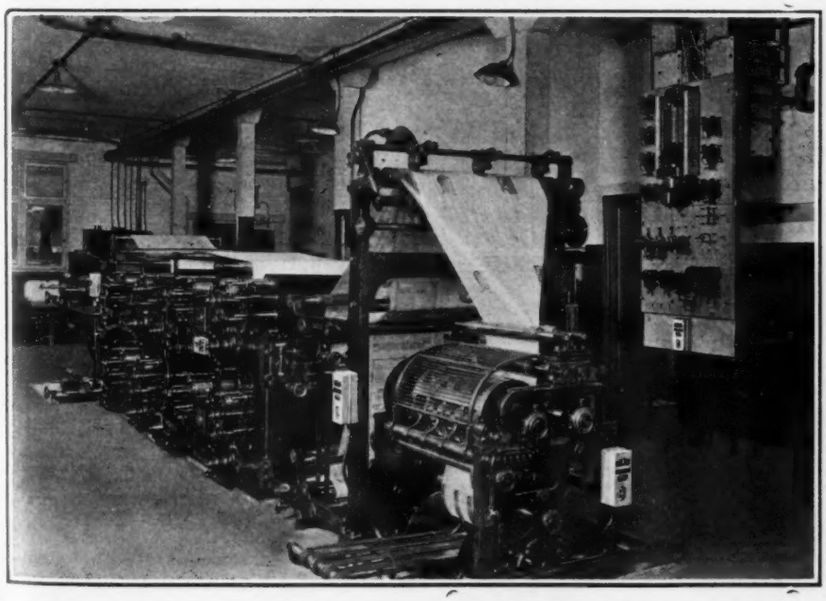
BY N. L. MORTENSEN
Assistant Chief Engineer
Cutler-Hammer Manufacturing Company, Milwaukee, Wis.

TO PROVIDE flexible operation and increase production of large newspaper plants, new control equipments have been developed enabling various printing combinations. Furthermore, for reliability and by virtue of arrangement of press units, drives and interlocking systems, one or more controls are held in reserve to be used in case of breakdown without additional drives or control equipment. The control equipments are arranged in connection with transfer switches, so that predetermined printing combinations can be obtained. These transfer switches connect the push-button stations, mounted on the printing press unit, with the usual signal system and the selected controller drive. Also, in printing small editions of short duration just previous to a large final edition, the presses not used can be cut out while a few press units are printing the small edition. Combinations can be set up so that upon completion of the small edition the additional units required for the large edition are connected in by means of transfer switches, making all of the stations on the press units that are used for the edition operate with the minimum loss of time.

There has been a further development in connection with the control for color proof-presses to meet the increased demand for multi-color work and advertising. In the past, single proof-presses have been used, and one color only is printed with one set-up, requiring as many printing presses as there are colors entering into the production of the proof. Development in control has made it possible to use multi-color presses, which, through the co-ordination of different units in the presses, makes it possible to obtain several colors with one press, thus increasing the efficiency, accuracy and protection, and permitting a reduction in labor. With the multi-color proof-press, consisting of four or five units, two operators can perform more work in a given time than four or five single presses, each requiring an operator. In the multi-color proof-press, the proof sheet is not removed from the cylinder for the different colors, but is printed in one operation with the various colors. This operation is predetermined by a selector switch in the electric control. The various press units are brought into operation by means of a selector combination, containing a selector switch lever for each unit. One, two or three colors can be obtained as readily as five-color work for any combination automatically by the pre-setting of this selective switch lever.



JOB PRESS INSTALLATION WITH PRE-SET CONTROL AND ACROSS-THE-LINE STARTING FOR BLOWER MOTOR



DUPLEX PRESS WITH AUTOMATIC PRINTING CONTROL AND PUSH-BUTTON STATIONS

Electrically Heated Tinning Pots

A NEW method of heating sheet-metal tinning pots, utilizing electric heat, has been devised. Among the advantages claimed for it are (1) desired thickness of tin deposited at all times; (2) need of attendance eliminated through automatic control; (3) loss of tin, through overheating and excessive oxidation, eliminated; (4) danger of firing oil eliminated; (5) low main-

tenance and long life, and (6) better working conditions in the shop, dirt and gases being eliminated and room temperature lowered.

One of the new, electrically heated tinning pots has been in operation for several months in a steel mill. The tin is heated by means of cast-in electric immersion units located inside the pot and automatically controlled. Temperature fluctuations are prevented, a uniform coating of the sheets is secured and the danger of firing the oil or oxidizing the tin is eliminated. The connected load for the pot is 125 kw. and the hourly consumption is approximately 85 kw.-hr., giving an average of but 4 kw.-hr. per base box.

It is expected that by the use of the electric method the over-all cost of tinning will be considerably reduced and a more uniform and better quality of product obtained.

Transformer Leads in Concrete Pedestal

IN THE 25,000-kw. Yonah hydroelectric plant of the Georgia Railway & Power Company on the Tallulah River concrete posts are used to carry the 6,600-volt leads to the transformers in the outdoor substation. Each pedestal, shown in the accompanying illustration, carries one phase conductor from the generator to each of the three single-phase transformers. Pedestals of this design do away with the use of potheads.

A 6-in. I-beam forms the main support of the pedestal, with twelve ½-in. square reinforcing bars placed as shown. Four-inch fiber conduit carry the transformer leads. Necessarily, care must be taken to see that no loop of metal is placed around a conduit or cable.

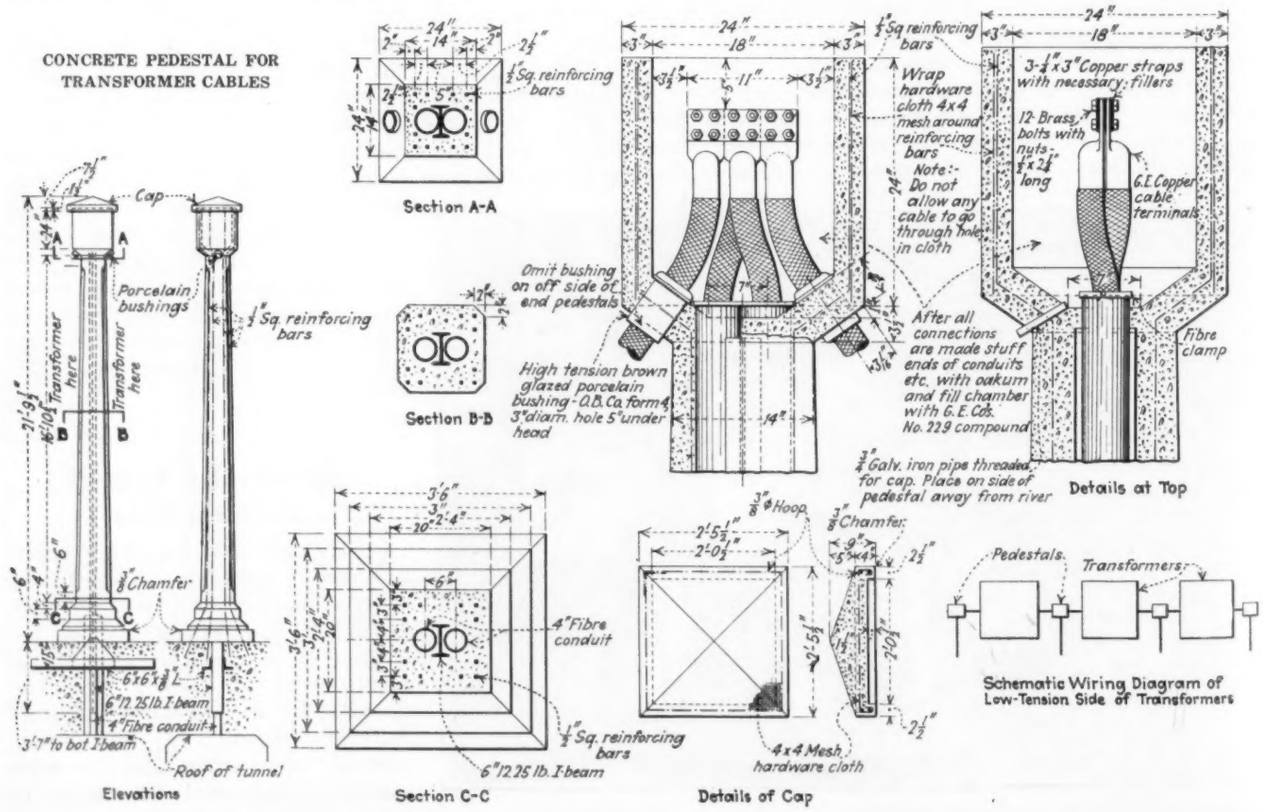
A.C. Tandem Drive Applied to Textile-Finishing Machines

A NEW method of driving textile-finishing machinery when operated in tandem, involving the use of alternating-current motors, has been evolved and instituted in a number of textile mills. This application, requiring the use of a motor with shunt-speed characteristics, has heretofore involved the use of direct-current motors.

With the new method, a self-contained, adjustable speed, alternating-current motor with shunt characteristics is used. The motors in each group of machines are synchronized by means of a compensating gate placed between each unit and the next. This gate consists of a vertical frame of wood or metal on which are located three more rollers over which the cloth passes. One of these rollers moves in a vertical plane between guides, with fixed limits of travel, and is counterweighted to permit free movement. The remaining rollers are stationary.

The main motor, driving the center frame, is equipped with a fractional horsepower motor operated by a push-button station and which changes the speed of the main motor by shifting its brushes. Such changes in speed, being communicated to the cloth passing through the rollers, raise or lower the movable roller on the compensating gate. The vertical movement of the movable roller is instantly reflected by a corresponding change of speed in the motors driving the other machines in the finishing group, such as mangles, dry cans, etc. The speed of these secondary motors is governed by the position of their brushes, which are moved through mechanical or electrical connection to the floating roller in the compensating gate. Through this interconnection or interlocking, the speed of all the driving motors is maintained at the same rate, and as a result the speed of the cloth is constant.

One control panel governs all the driving motors, and it is so arranged that all the motors may be run in tandem or individually. By the use


CONCRETE PEDESTAL FOR TRANSFORMER CABLES
Cap
Porcelain bushings
Transformer here
Transformer here
⅝" Chamfer
4" Fibre conduit
6"12.25 lb. I-beam
Roof of tunnel
Elevations
Section A-A
Section B-B
Section C-C
Omit bushing on off side of end pedestals
High tension brown glazed porcelain bushing - O.B. Co. form 4 3" diam. hole 5" under head
Wrap hardware cloth 4x4 mesh around reinforcing bars
Note:- Do not allow any cable to go through hole in cloth
3-¼"x3" Copper straps with necessary fillers
12- Brass ⅞" bolts with nuts - ⅜"x2½" long
G.E. Copper cable terminals
Fibre clamp
After all connections are made stuff ends of conduits etc. with oakum and fill chamber with G.E. Co's. No. 229 compound
¾" Galv. iron pipe threaded for cap. Place on side of pedestal away from river
Details at Top
⅝" ϕ Hoop
⅝" Chamfer
4x4 Mesh hardware cloth
Details of Cap
Pedestals
Transformers
Schematic Wiring Diagram of Low-Tension Side of Transformers

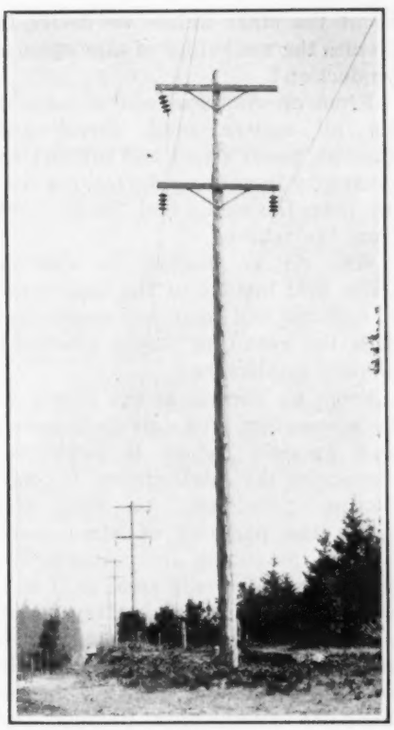
of push buttons at the main control station all motors may be started, jogged or stopped simultaneously, the speed increased or decreased, and the control changed from tandem to individual or vice versa. When operating individually, separate push-button stations at each printing machine control each driving motor, and the compensating gates are not in use.

When the secondary or follower motors can be conveniently located near their respective compensating gates, mechanical control is used—that is, changes in speed of these motors are governed by mechanical connection of the brushes to the floating roller in the compensating gate. Where this is impractical, the motors being at a distance from the compensating gates, electrical control is used. In such cases each follower motor is equipped with a pilot motor for shifting its brushes and thus controlling its speed. This pilot motor is governed by a limit switch mounted directly on the compensating gate and actuated by the movable roller.

Single-Pole Construction for 110-Kv. Line

A TYPE of construction is being used by the Puget Sound Power & Light Company that permits supporting a 110-kv. circuit on a single wood pole line, as shown in the accompanying illustration. This particular illustration shows a 60-kv. line near Tenino, Wash., built several years ago, but the type of construction is the same as that employed on the 110-kv. line recently completed between Everett and Skykomish, Wash., for supplying the Great Northern Railway electrification project.

As indicated in the illustration, the top conductor is alternated from one end of the top crossarm to the other. The purpose of this is to keep the top conductor out of vertical alignment with either of the lower wires to prevent the bottom conductor from whipping up into the one above when ice or snow runs off the lower wire. The conductor configuration has the further advantage that it gives practically an equilateral triangle, which is advantageous from a circuit characteristic standpoint. The big feature, of course, is that only a single-pole line is required for a 110-kv. circuit, as against a two-pole H-frame



TOP WIRE IS ALTERNATED ON TRANSMISSION LINE TO PREVENT VERTICAL ALIGNMENT OF CONDUCTORS

structure usually employed. No trouble has been experienced from the inclined position of the top suspension insulator string and none is anticipated.

Power Lost in a Transmission Line

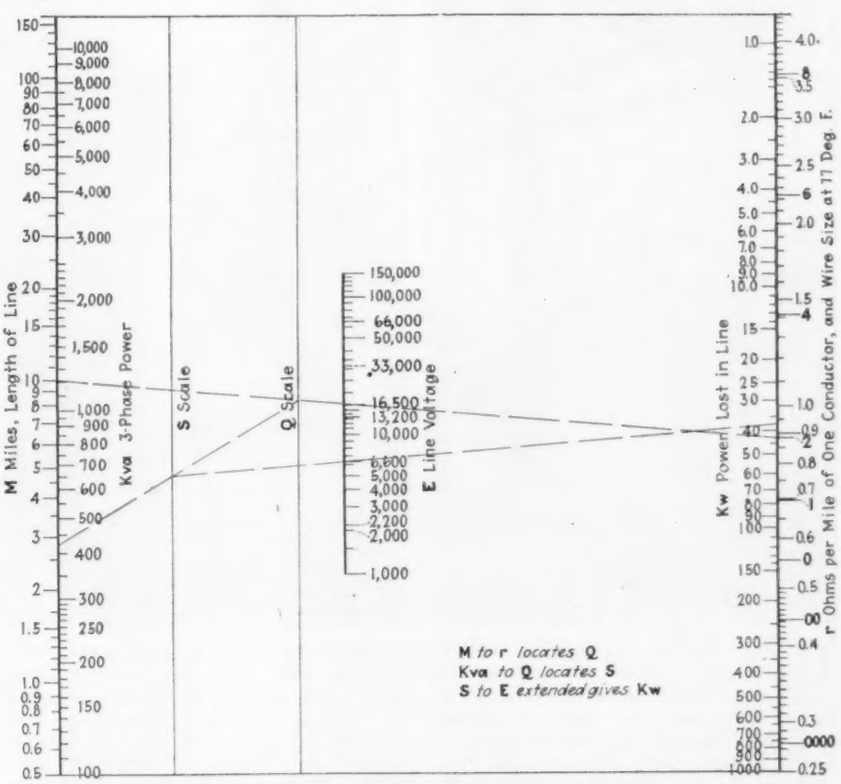
IN THE April 19 issue of the ELECTRICAL WORLD on page 1349 will be found an alignment chart that gives the voltage drop in a transmission line where the constants are known.

In short transmission lines the per cent power lost in the line is approximately equal to the per cent voltage drop. The chart referred to can be used to determine the per cent power lost as well as per cent voltage drop. A more convenient way of showing this line loss is to express it in kilowatts instead of per cent.

The chart here given is designed so the power lost in a given line can be very quickly calculated.

The method of operation is as follows: Using a straight edge, connect the size of wire *r* with the length of line in miles *M*, locating a point on the *Q* scale. Connect this point with the *kva.* to be transmitted and a point on the *S* scale is located. By connecting this point with the line voltage to be used and extending the line to the power lost or *kw.* scale the answer can be read directly.

The index lines given are for a line using No. 2 copper, ten miles long, transmitting 427 kva. at 6,600 volts. The kilowatts lost are shown to be 37.


M Miles, Length of Line
Kva 3-Phase Power
S Scale
Q Scale
E Line Voltage
Kw Power Lost in Line
r Ohms per Mile of One Conductor, and Wire Size at 77 Deg. F.
M to r locates Q
Kva to Q locates S
S to E extended gives Kw

ALIGNMENT CHART FOR DETERMINATION OF PERCENTAGES OF VOLTAGE DROP AND POWER LOSS

It will be noted that the resistance for the various sizes of wire does not agree with the value given in the previous chart or with many tables in general use.

The resistance value is used so the values of power lost will agree accurately with tables published by a large manufacturing company and which are in such general use throughout this country. These tables cover six large pages, whereas the same result can be obtained by this simple chart and the chart is by far the more flexible to use.

Conjectures and Speculations

AIR CONDUCTION

BY C. L. KASSON
Edison Electric Illuminating Company of Boston

IT IS possible to measure the leakage current and watt input into the atmosphere from a given direct-current stress source. The atmosphere is matter and conducts electricity. Why then do we talk about the ether unless we desire to discuss the mechanics of atmospheric conduction?

From an electrical source, why is not all matter solid, liquid and gaseous, under stress and conducting electricity in varying degree, depending upon the media and the distance from the source?

Why do we discuss the electrostatic field instead of the conception of multiple and combined conduction with the resulting stress gradients thereby established?

From an electric stress source in the atmosphere if the stress is raised high enough, corona is perceived. Obviously the atmosphere is conducting previously to this and finally the particles of atmosphere nearest the source are rendered incandescent. It would seem as if this were the same as the heating up of a solid body to the luminous stage except that the hot particles of air are thrown off and their places are taken by fresh ones because the particles are mobile.

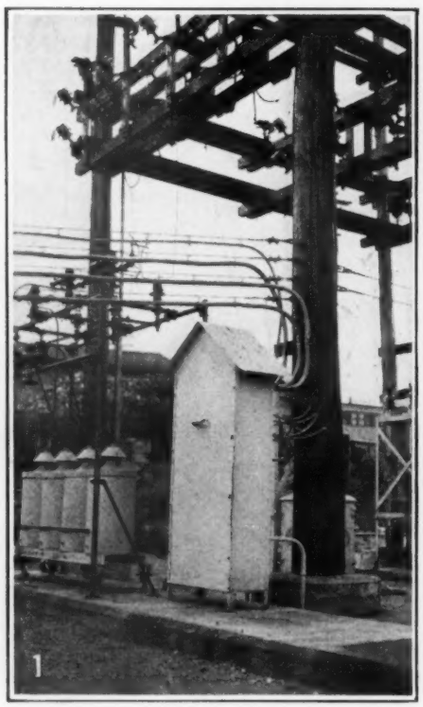
Why is not corona continuous unconcentrated air breakdown? In a solid dielectric, a direct-current stress produces a slight current flow. At breakdown this rapidly increases and a new substance is formed. For instance, impregnated paper is changed into carbon. In a similar way the atmosphere may conduct under stress prior to and at breakdown. This stress may be due to nature. We see the lightning and from this may logically deduce that electricity is present prior to the flash. The flash is concentrated breakdown.

In corona the eye perceives light. If the stress is raised, actual fire and flame result. Why then is not daylight that which the eye perceives when the electric content of the atmosphere is sufficient?

The atmosphere we discuss as an insulator and as a dielectric. The dielectric under stress is thus associated with light. A low-resistance conductor under stress we associate with heat.

Heat and light might thus be spoken of as the manifestations of electricity in matter as perceived by us through our senses.

Remote-Control Cabinet Made by Central Station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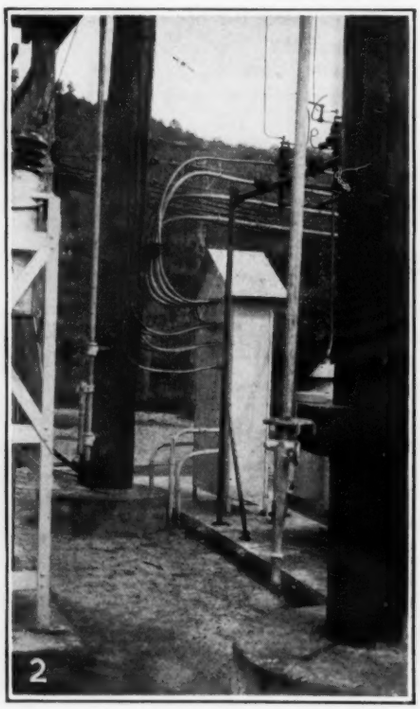
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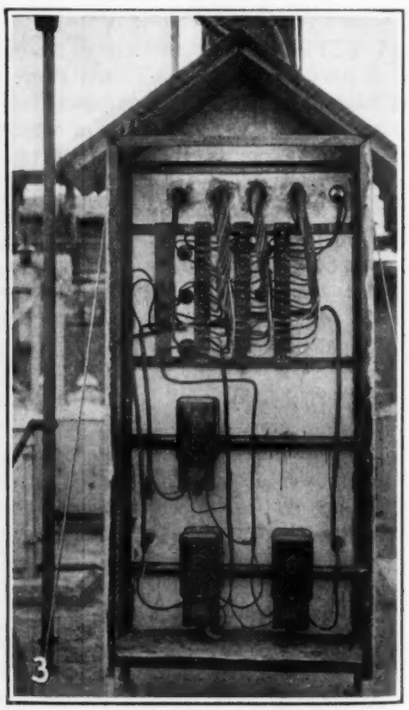
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IN EQUIPPING its outdoor switching station at St. Johnsbury, Vt., the Twin State Gas & Electric Company developed the control cabinet illustrated herewith to provide adequate housing for relays and terminal connections associated with various oil circuit breakers, current and potential transformers. Three 11-kv. outgoing feeders are controlled from this station. The cabinet is a housing of No. 18 gage galvanized iron, 5½ ft. high inside with a 12-in. roof peak, the interior being 2½ ft. wide x 12 in. deep, with a frame of 1-in. steel angles. The relays are mounted on 1¼-in. pipe and the various control cables are lead-covered and supported from stranded steel messenger wires by loops as shown in Fig. 1.

Terminals of current and potential transformer circuits, spare binding posts and direct-current 125-volt wires for solenoid switch operation are carried on treated wooden strips inside the cabinet. Current and potential transformer leads run in 3-conductor, No. 10 "Bx" from the cabinet to these units. A somewhat similar terminal arrangement is installed in the generating station a few rods distant. The cabinet was designed and built by L. F. Gray and H. E. Pinard of the company's operating staff.

Commercial Activities and Public Relations

Over 900 Ranges Sold in Alabama Campaign

BY H. W. PARRISH, JR.
Commercial Department, Alabama Power Company, Birmingham, Ala.

THE range campaign conducted by the Alabama Power Company from April 15 to May 31 resulted in the sale of 905 electric ranges, as against a quota of 572. Thus the quota was exceeded by 158 per cent and last year's campaign sales of 430 ranges was far surpassed. The distribution of the sales over the various divisions is shown in the accompanying illustration. The Alabama Power Company is divided into four divisions, and the Mississippi Power Company, the Gulf Electric Company and the Pensacola Electric Company are each considered as a unit.

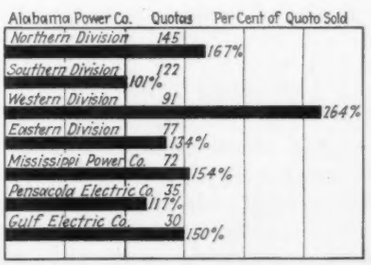
All previous campaigns conducted by the company netted from 300 to 500 range sales, which was considered good by those familiar with local conditions. However, it was believed that past performances were too low and that an exceptionally successful campaign could be conducted with the proper effort and thought, one that would far exceed any past results. With this in mind each division sales supervisor and the merchandise managers of the subsidiary companies were called in to the regular merchandising meeting, with the electric range campaign as the primary subject to be discussed.

At this meeting all campaign details were gone over, and past advertising and special features were reviewed and new ideas were taken into consideration. Every man set his division quota with the determination to exceed it, and the results showed that quotas meant very little in the actual sales work. Just prior to the campaign a detailed campaign set-up was sent to all salesmen and all employees other than those directly in sales work who had played a conspicuous part in merchandise activities. Trips to range factories and cash prizes were offered as extra incentives to every one in making more sales. A commission of 10 per cent was paid to all employees other than the regular salesmen. Where assistance of salespeople was necessary, commissions were divided in order to get the cooperation of every employee.

The method of paying for the ranges was a special feature of the campaign. An initial payment of $10 was asked, with the remainder in fifteen equal monthly instalments. A good set of aluminum ware was given with each range. Demonstrations were held in all the main properties, broadsides were sent to prospects, newspaper advertising was used and in general the usual campaign work was performed, but performed in a way superior to any used in the past. Demonstration details were worked out better. Division and district meetings were held prior to the campaign as well as during it to stimulate the interest of every one.

During the demonstrations the demonstrators were assisted by the local manager as well as by the division sales supervisor, who traveled with the demonstrator in most cases to see that plans were carried out and to assist with talks. Follow-up work by the manufacturers' representatives was found beneficial.

The weekly commercial department publication, *Sales Meter*, carried a graph each week showing the exact position and percentage of quotas reached by each division. This created enthusiasm, inasmuch as every man could see where he stood. The accompanying illustration shows the final results of the campaign.



HOW THE ALABAMA POWER COMPANY EXCEEDED QUOTAS IN RECENT ELECTRIC RANGE CAMPAIGN

RESULTS OF ELECTRIC RANGE CAMPAIGN CONDUCTED BY THE ALABAMA POWER COMPANY

	1925 Campaign	1926 Campaign	Per Cent Increase
Total ranges sold....	430	905	210
Alabama Power Company			
Ranges sold.....	430	708	165
Quota.....	275	435	158
Excess over quota...	155	273	
Per cent excess over quota.....	156	162	
Mississippi Power Company			
Gulf Electric Company			
Pensacola Electric Company			
Ranges sold.....		197	
Quota.....		137	
Excess over quota.....		60	
Per cent excess over quota.....		144	

Utility Services Installed by Realtor

NEAR one of the golf clubs in Minneapolis a progressive realtor has plotted an extensive residence section, known as the Thorpe addition, in which have been provided not only sewer, gas, and water service, paved streets with curbs and sidewalks, but, what is more unusual, telephone and electric service lines. The latter have been run along the rear property line of every lot. Based on the type of homes already built (about 100), there is space for about 500 homes.

Before the section was built up it would have been economically impossible for the local utility companies to provide complete city services, and even after some homes had been erected service extension charges would have been imperative. Recognizing the enhanced value these utility services would impart to this desirable residential section if installed in advance of purchase, the realtor financed and deeded the physical equipment over to the respective utilities, which in return installed the lines and agreed to refund a certain percentage of the revenue therefrom for the next five years.

The pole lines that carry both the telephone cables and the electric service wires are without crossarms, a type of construction much more sightly than poles with crossarms. This construction is made possible by the use of a ridge pin that carries the ungrounded side of the primary and a four-spool primary bracket carrying the three-wire secondary circuit and the controlled side of the street-lighting circuit. A transformer is installed at the center of each block in order to reduce secondary losses to a minimum. Where the lines cross street intersections

they are carried underground, terminating in pot heads on the last pole at the end of each block.

The street lighting is carried out by means of curb posts with multiple lamps fed from the secondary lighting circuits.

When installing the electric-service lines, adequate capacity was provided to serve electric ranges in addition to the customary household devices. As a result virtually all the homes built so far have been equipped with electric ranges without having to reinforce the service facilities. Since one substation feeder serves this entire section, a very thorough analysis is being made of the character of the range load. These data, however, will not be available until more homes are built.

Newspaper Advertising in the Smaller Community

BY J. A. FEDERHEN

A NEW departure has been taken by the Fort Smith Light & Traction Company, a utility operating three services in Fort Smith, Ark. Just what to advertise in the smaller community has always been a problem with utilities, but the traction company has hit upon an idea that seems to have met with considerable favor.

It was decided to use the regular newspaper space as a tabloid newspaper, featuring in that space community events and tieing the reading matter in with the company's business where possible. The name *Community Progress* was decided upon, and in all the newspapers of Fort Smith and in some in other properties of the company this type of advertising is carried.

The advantages in favor of the plan to date are that many compliments and complimentary letters have been received, proving that it is being read, which is a test of any advertising. When an item is placed in the space, the approval of the individual or the firm concerned is always obtained, making a very important and pleasing contact.

It furnishes an established medium in case the company may desire to present any of its problems directly to the public.

It does away with the idea that utilities are placing advertising in the newspapers because they have to patronize that type of publicity.

It is very important from a public relations standpoint, the Fort Smith Light & Traction Company, through Mr. Coffy, vice-president and general manager, feeling that *Community Progress* is making many friends for the company and giving it a regularly read space in which to present a frank discussion of the progress of the community, which is so intimately connected with that of the company.

Power Business in Small Towns

SOME power prospects can be found in any town, village or crossroads community, according to W. D. Hart, general contract agent of the Illinois Northern Utilities Company, Dixon, Ill., which operates in a number of small towns in Illinois. The village market keeper needs refrigeration, both for his own sake and that of his customer. It is a desirable load which can be successfully operated off peak. Water can be pumped for the village waterworks off peak. Sand and gravel plants are off peak, both yearly and daily. In a town of 1,500 population with 500 meters, a grist mill with a connected load of 60 to 80 hp. is the rule rather than the exception. Such a load, by its nature, is off peak and should enjoy a preferred rate. The frequent starting and stopping of the equipment require electrical energy. It takes but a few customers of this character to balance a goodly number of lighting customers. Filling in the gaps with electric cooking makes good looking load curves. The smallest community supports a grain elevator, a garage and a blacksmith shop. "Get this load; it is the cream of your income, and they will appreciate your service," advises Mr. Hart.

The besetting sin of the small power customer is overmotoring, with resulting poor power factor. This may be held down only by constant viligance on the part of the utility organization; the maximum demand power rate is the best aid in overcoming this particular difficulty. Recommendations that will show the customers how to hold down their peaks and save money are seldom rejected and usually greatly improve power factor.

WHERE UTILITY CAN AFFORD LOW-LOAD FACTOR BUSINESS

Utilities operating in small communities can afford to take low load factor business, because the diversity factor is great enough to permit the company to absorb it with safety, Mr. Hart considers. The company should be able to show its customers that the dependability, flexibility and convenience of purchased power are worth the price. Should the business be such that the need for power is occasional or approximately momentary, though very needful when that moment arrives, the prospective customer can usually well afford to slow down the special operation, thus reducing his demand and improving his load factor.

Overhead is too lightly considered in the average business man's accounting system, declares Mr. Hart. If any one were fully to consider interest, depreciation, maintenance and convenience when figuring operating costs, individual power units would have "no legs to stand on" despite the minimum bills and high rate portions of schedules required by utilities. The yearly rather than the monthly minimum bill has solved the seasonal load problem for both customers and utilities, resulting in some mutually attractive power business.

RESULTS IN ONE COMMUNITY

Mr. Hart has practiced what he preaches. In his territory, which is rural rather than industrial, some rather large and many small power loads have been picked up in the past fourteen years and the load factor has been improved fully 10 per cent. Illustrative of the fact are the following data: On Saturday, Oct. 12, 1913, the peak load of a certain division was 1,060 kw., the average load for the day 561 kw., showing a daily load factor of 52.9 per cent. Twelve years later, in the same division, on Saturday, Oct. 10, the peak load was 9,530 kw., the average load for the day 6,008 kw., and the resulting daily load factor 63 per cent. This increase has been accomplished in spite of the fact that the new towns added have been chiefly those with a population of 100 to 1,000 persons, which would normally tend to decrease the load factor.

Constant plugging for the business of the small power customer has built up the day load to such a point that the summer peak is now in the daytime rather than in the evening, due to lighting. A sufficient amount of

the business is off peak so that the company does not suffer during that portion of the year when light and power demands overlap.

Bases on Which to Sell Purchased Power

EVERY power-sales engineer has found that certain advantages of purchased power are more quickly appreciated than others by prospective customers, with the result that these advantages are more frequently cited. When advantages cannot be evaluated in dollars and cents, frequently a slight illustration of the work which their absence will entail has been found to convince the customer of their vital significance. Other advantages, on which a power salesman has no specific data, have been made to convey their importance to a customer when he is asked to evaluate them himself.

Self-analysis and self-selling is often the most convincing kind and need not be slower than aggressive selling if properly guided. Some salesmen have even declared that less detailed analysis on their part has been required and the prospective customer has been convinced of the value of purchased power more quickly by merely outlining the items that make up the cost of purchased or private service and discussing each one with the customer to get his evaluation thereof. The customer is not left with the feeling that figures have been forced on him.

Some advantages of purchased power that have been found particularly illuminating when considering private generation have been tabulated in the accompanying list. Many of the advantages cited are paraphrased from a list recently made available by Oscar Gaarden, Northern States Power Company, Minneapolis. In citing these advantages to sell purchased power, the ingenious power salesmen will always recall sufficient illustrations and incidents on which to hinge these generally expressed advantages, thus making their true importance more evident.

SEVENTEEN ADVANTAGES OF PURCHASED POWER

1. Assures power supply during strikes.

2. Lower investment in power equipment. Investment in private generating equipment would bring greater return if applied to extensions or improvement of industrial production methods or commercial practices.

3. Elimination of investment in fuel storage, boilers, engines, piping, power plant switchboard and wiring required for private generation.

4. Eliminates the investment represented by space requirements for power generation.

5. Shutdown or curtailment of customer's business does not leave non-dividend returning investment in generating equipment on customer's hands when he may be least able to shoulder the burden. Furthermore, no generating equipment has to be protected against deterioration during shutdown, as would be required in a private plant.

6. Disposal of used private generating equipment at a desirable price is not always easy, so that there is a handicap to keeping the economy of a private plant up to date by changes.

7. Less attention of superintendents and management required than with private plants, which involve securing and handling labor, fuel and supplies. The time so saved can be devoted to more profitable activities.

8. Less danger from fires and explosion than when fuel is stored and used for private generation.

9. Insurance rates are less.

10. Unlimited supply of power on short notice when production facilities must be increased quickly or advantage taken of more improved methods.

11. Additional purchased energy is obtained on lower steps of rates, whereas additional private generating units will tend to increase average cost until fully loaded.

12. Service restorations after accidents made in less time, so financial equivalent of lost production is reduced. Repairs to private plant generating equipment may require days or even weeks unless costly duplicate equipment is available. More flexible arrangements exist for terminating purchased-service interruptions.

13. Utility experts available to customers for advice when power application problems arise. With a private plant this advice would not be free.

14. Lower net cost of energy.

15. Reasonable stability of energy cost. With private plants varying costs of coal, fuel, oil and labor make it difficult to predict private generating cost.

16. Greater cleanliness — no smoke, ashes or exhaust gases.

17. Less noise, which may be objectionable to surrounding residents.

Floodlight Picture of the Biggest Crowd Ever Assembled for a Sporting Event

THIS photograph, taken at 8:30 o'clock the night of the Dempsey-Tunney fight, was made possible by eleven batteries of floodlights, which spread a radiance over the stadium equal to the light of 300 full moons. The illumination would be sufficient to light 1,500 homes. The floodlighting equipment consists of 190 Form L-22 floodlights with 1,500-watt lamps, a total illumination representing a load of 285 kw.

Digest of Electrical Literature

Hydro-Electric Development and Steam Equipment

The Yallourn (Victoria) Power Station.—S. EDGAR BARRATT.—This paper supplies, first, a brief outline of the whole of the activities of the State Electricity Commission of Victoria, Australia, and second, a general description of the Yallourn power station, brown-coal winning and the main 132,000-volt transmission line. Water-power development has received much attention on the part of the committee, and several of the available sources of power have been investigated. The result has been a decision to build a group of six power stations in the vicinity of the Sugar Loaf Dam, the aggregate capacity being over 30,000 kw., and construction work is to commence almost immediately. The power from each of these stations will be fed to a common switching station and transmitted partly in a northeasterly and partly in a southwesterly direction at a pressure of 66,000 volts. The energy transmitted southwesterly will be fed into the Melbourne system to a second switching station in order to supplement the Yallourn power in times of heavy winter load. The transmission line is at present operating over its whole length and is temporarily supplied with energy drawn from the Yallourn station. It should be mentioned that although the first turbo-alternator went into service as far back as the middle of 1924, the station is not as yet working at its full rated output. When the full output is reached it is possible that present generating costs will be considerably reduced to within the vicinity of the figures originally expected. The power station consists essentially of three buildings, namely, power house, turbine house and switch house. The switchgear is all mounted outdoors adjacent to the switch house, only the actual control gear being mounted indoors. The first section of the power station to be completed comprises twelve water-tube boilers generating steam for five 12,500-kw. turbo-alternators and one 600-kw. house set. While normally four units will operate to give the station an additional output of 50,000 kw., the station may ultimately have an output of 150,000 kw. —*World Power*, September, 1926.

Problem of Steam-Boiler Corrosion. —FRANK N. SPELLER.—Before proceeding to a consideration of ways and means for preventing corrosion in boilers, the author undertakes an inventory of the more important facts which have been well established with reference to the mechanism of corrosion in general. He explains in detail the different stages of corrosion and their causes. In handling the subject of feed water, consideration is given to the effect of dissolved oxygen, the presence of carbon dioxide, of salt, alkali and the acid content. The oxygen content, scale-forming properties and hydrogen-ion concentration of the water are the main factors in boiler corrosion and are closely related. Although water is generally rendered less corrosive by increasing its alkalinity, a certain degree of alkalinity increases the tendency to pit, and an excessive alkalinity in water free from sulphates seems to be associated with embrittlement of the steel in the boilers. Hence, according to the author, it is important to establish and maintain a certain range of alkalinity, depending upon the composition of the water in the boiler and on operating conditions. Charcoal iron and low-carbon bessemer and open-hearth steels have been used for boiler construction with very little difference in the rate of corrosion or pitting. It is difficult and costly to make boiler tubes of corrosion-resistant metals, such as high-chromium iron or the nickel-chromium alloys. Until tubes can be made of a material decidedly better than low-carbon basic open-hearth steel, there will be little advantage in making other parts of the boilers of these more expensive steels, inasmuch as the tubes are the vulnerable parts and usually the first to fail. Much attention is given by the author to a description of preventive measures, and special applications of water treatment to various kinds of steam boilers are supplied.—*Mechanical Engineering*, October, 1926.

Generation, Control, Switching and Protection

High-Power Fusible Cut-out.—L. C. GRANT.—In view of its fundamental importance the problem of rupturing capacity was selected by the author as that to which attention would be primarily confined in his paper. The paper includes a consideration of the factors influencing the rupturing capacity of a cut-out and a description of an extensive series of tests carried out on various types of cut-outs, including many of those most widely used today. A selection is given from the records of tests, with fundamental forms of elementary construction, on plain cut-outs and plain commercial forms, and this shows the inadequacy of such cut-outs for high-power work. Certain recently developed forms of cartridge cut-outs which operated satisfactorily are referred to and their sphere of usefulness is indicated. Description is given of an ironclad, oil-immersed cut-out which appears from the test to satisfy nearly all requirements for high-power work. A design of cut-out for small-turn, high-pressure services is also described. An attempt was made by the author to ascertain by carrying out actual rupturing-capacity tests how far the various types of cut-out can be safely employed. The paper includes a chart which has been drawn up to show a comparison between the rupturing capacities of these types. A striking feature made apparent by the test is that there are remarkably few efficient cut-outs available.—*Journal of Institution of Electrical Engineers (England)*, September, 1926.

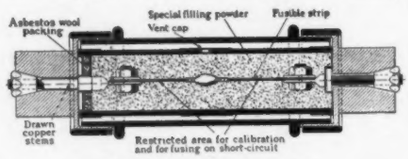


FIG. 4.—Section of filled cartridge cut-out—ONE OF SEVERAL TYPES OF CUT-OUTS TESTED

Transmission, Substations and Distribution

Interconnections in Virginia and North Carolina.—WILLIAM C. BELL.—Interconnections between several of the electric service companies in Virginia and North Carolina are now in operation, others are being constructed, and still others are under consideration in connection with the normal expansion of the various power systems. A brief discussion of the accepted meaning of the terms "interconnection" and "superpower" are given by the author before discussing the actual results which have been accomplished up to this time in the area under consideration. Arrangements whereby electrical energy is interchanged through interconnections are placed in one of three general classes: (1) Those interconnections where a group of two or more companies tie their power systems together and pool the capacity available in order that electrical energy may be generated and distributed as though the interconnected systems were one large system; (2) those interconnections where a group of two or more companies tie their systems together primarily for mutual protection and for interchange of surplus energy; (3) those interconnections which are made for the definite purpose of supplying capacity and energy to a company which prefers to buy a part or all of its requirements rather than to construct or increase its own generating facilities. The paper concludes with a general list of the advantages of interconnections.—*Mechanical Engineering*, October, 1926.

Units, Measurements and Instruments

Current-Transformer Characteristics. —G. L. E. METZ.—This paper outlines the general requirements for satisfactory operation of current transformers, discusses the ideal transformer and describes some interesting tests which were carried out at the University of Ontario by Prof. H. W. Price. Several vector diagrams are contained in the article to illustrate more clearly the mathematical development as outlined by the author. Particular emphasis is laid on the reactive values of current transformers, and a table contains comparative values for different types of transformer design. — *Electrician (England)*, Sept. 3, 1926.

New Precision Instruments. — G. KEINATH.—Following an urgent demand for precision instruments for alternating current which would be smaller and less expensive than the hitherto known laboratory type, a large German firm developed recently a new line of voltmeters and ammeters called the "dwarf" type. The salient features

of these instruments are a metal case, a knife-edge pointer, a metal scale with inlaid mirror sector, 2,000-volt insulation, accuracy of 1 per cent of highest reading, double scale with 1½ and 3 as factor, very small current consumption and three built-in fuses against overload, suitable for use in the tropics. Wattmeters of the same type are built. —*Siemens Zeitschrift*, July 1926.

Illumination

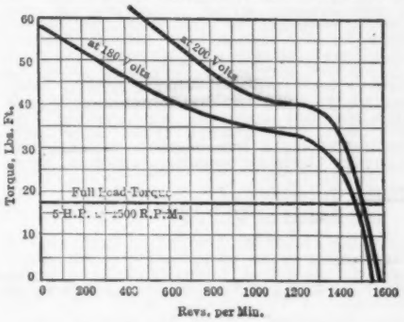
Year's Progress in Illumination.—Judging from the references to be found in this report, interest in illumination in European countries has been strongly maintained. Progress in England is particularly evidenced by the increasing number of researches being carried on and the general educational work of the lighting service bureaus. The committee presents in this paper statistical data and comments on gas, incandescent lamps, arc and vapor-tube lamps, lamps for projection purposes, street lighting and other exterior illumination, interior illumination, photometry, physics, physiology and illuminating engineering. The report occupies the greater part of the *Transactions of the Illuminating Engineering Society* for September, 1926.

Electrophysics, Electrochemistry and Batteries

Automatic Charging Apparatus.—W. KLEIN.—Charging methods for storage batteries which automatically disconnect the cells from the line when the charge is completed are known and used. Their principle is either to dose the charging energy in accordance with the known discharged energy or to disconnect the battery from the feeder after a certain end voltage has been reached. Neither of these two principles is theoretically correct, because they are both affected by the rate of charge. In addition, the second method suffers from the difficulty brought about by the very gradual approach of the critical end voltage, calling for exceedingly sensitive contact voltmeters. It was found that the normal charging cycle of a lead battery shows a very distinct and abrupt voltage kink, which takes place at about 2.3 volts per cell. The time from the beginning of the charge to this point varies according to current and temperature. On the other hand, the time from 2.3 volts to the final 2.7 volts is always the same. Consequently an automatic switch was designed which contains a contact-making voltmeter and a time switch. The former has no difficulty in responding positively to the very pronounced and rapid change from about 2.3 volts to 2.6 volts, while the latter is a simple clockwork device, set once forever. By means of several examples the proper setting and use of this new automatic charging switch is explained.—*Elektrotechnische Zeitschrift*, Aug. 12, 1926.

Motors and Control

Squirrel-Cage Repulsion Motor.—G. WINDRED.—This article provides some notes on a recent development in single-phase commutator-motor construction and gives details of its advantages over existing types of equipment. A large number of single-phase commutator motors have been developed during recent years, and a general effort has been made by designers to produce a reliable motor which could compete with the polyphase type in the matters of starting torque and overload capacity without losing the important features of simplicity of construction and operation. The object of the present paper is to describe a recent development of single-phase repulsion-motor



CURVES OF TORQUE DEVELOPMENT FOR VARYING SPEEDS

practice which represents a marked improvement in many respects upon the various types already in existence and to point out the advantages of the machine over the existing types. Constructional details of the new single-phase machine which differentiate it from anything previously designed deal principally with the stator, which is arranged with a single-phase chain winding, the terminals of which are attached during operation to the supply mains, while the rotor carries a similar winding connected to a commutator in the same manner as the ordinary repulsion motor. In addition to the commutated winding, the rotor carries a squirrel-cage construction, the bars forming this winding being in slots some distance below those carrying the commutated windings. The rotor stampings are arranged so that the two sets of slots are connected by a narrow opening, in which a non-magnetic strip may be inserted in order to improve the commutation. The torque-speed curves of the new motor obtained by a brake test are shown in the accompanying chart, where the torque characteristic peculiar to this type of machine is clearly indicated, together with the manner in which the torque varies with the applied voltage. The shape of the torque curve would indicate that the motor develops a high-pull-out torque, thereby insuring that it will accelerate the load which it starts.—*Electrician* (*England*), Aug. 27, 1926.

Traction

Electrification of a Section of the Orleans Railway.—H. PARODI.—The author discusses the conditions which have led the French government to consider an extensive electrification scheme of which the railways will form only a part, and he then explains the general method adopted in drawing up the scheme and utilizing in the most economical manner the sources of power available. Particulars are given of the power supply to the Orleans railway and the rolling stock already in use and on order. The design of the electric locomotive is discussed and a comparison made between electric and steam traction. An interesting statement is that made concerning the average mileage which it is thought should be obtained per annum from the high-speed electric locomotive employed. The figure mentioned is between 100,000 km. and 120,000 km.—*Journal of Institution of Electrical Engineers* (*England*), September, 1926.

Electric Express Locomotives for Java.—E. SCHROEDER.—The general electrification program decided upon in 1917 by the federal government of Java provided for the gradual introduction of electric traction, with Batavia as starting point, to supersede the present steam operation. Railroads on the island are all built with a 3-ft. 6-in. track gage, but in spite of this narrow track the size and bedding of rails are such as to permit safely loads and speeds not materially below foreign standard-gage roads. One caloric and one hydro plant supply 70-kv., 50-cycle, three-phase current, which is changed in two substations into 1,500 volts direct-current. A Swiss concern furnished seven locomotives and fifteen motor cars on a preliminary order. A very complete description of the former, including many photographs, drawings and connection diagrams, is given in the paper. The engines are driven by four motors, each actuating one of the four driving axles over an elastic reduction gear. The locomotives develop a one-hour rating of 1,410 hp. with train speeds of up to 90 km. per hour. The motors are of the air-blast type with one blower for each motor. The service weight of the locomotive is 69,000 kg. The illumination of engine and train is supplied from a 72-volt battery which is charged automatically by a special motor-generator set. Unusual attention was exercised to make the entire electrical equipment withstand safely the adverse tropical conditions of Java.—*Brown, Boveri Mitteilungen*, August and September, 1926.

Telegraphy, Telephony, Radio and Signals

High-Voltage Direct-Current Cable-Testing Set. — A. VAN LIS. — Electric testing of underground cables, if done with high-voltage alternating current, requires very considerable energy on account of the changing current consumed by the capacity of the cable. To overcome this difficulty it was suggested that testing be done with direct current of an equivalent voltage. The early type of rotating Delon rectifiers, which mechanically converted alternating into direct current, had many disadvantages, and sets of this type were still too bulky and heavy to be portable. The development of the kenotron vacuum-tube rectifier solved the problem in a highly satisfactory way. The author, after giving a short theoretical explanation of the valve action of these vacuum tubes, describes a very compact and portable rectifier set.—*Electrotechnik und Maschinenbau*, Aug. 1, 1926.

Scientific & Industrial Research

[When investigations which have been completed are, in the opinion of the editors, of wide enough interest to the field we serve, details thereof will be presented in other parts of this paper. Contemplated research or that which appears to have limited appeal will be only briefly reported in this section, but details may be had by communicating with the investigator or institution named in the report. Readers are referred to the department "Digest of Electrical Literature" for investigations reported in other journals. The news and engineering sections should also be followed for research reported before technical societies.]

Research Completed

Acceleration, Measurement of

In the testing of rotating machinery, the correct determination of accelerations has always presented a problem when speed changes were a factor in the investigation. Our laboratory has developed a combination of an electrically controlled tuning fork, a "phonic wheel" and a chronograph, which, when combined with a simple form of contacting device on the shaft of the unit under test, enables records to be obtained from which may be derived with great accuracy all speed values while the test is under way. This apparatus has already proved of great value in studies of the performance of hydro-electric machinery.—*Hydro-Electric Power Commission, Toronto, Ontario.*

Clays, Sagger

Apparatus has been developed by means of which the thermal expansion of sagger clays can be determined rapidly and with satisfactory accuracy. Linear thermal expansion was determined, together with the expansion characteristics and the apparent relation of thermal expansion to porosity and resistance to failure in an air-quenching test. For a few clays, the effect of repeated burns and of additions of artificial corundum on thermal expansion were also studied.—*Bureau of Standards, Washington, D. C.*

Frequency Changers, Field Control of

An automatic control equipment has been arranged to remove the field excitation of the motor and reduce that of the generator of a frequency-changer set, when a disturbance occurs on the motor circuit, and again to restore the excitation when the line voltage is normal. This requires a special pole-face winding to enable the motor to resynchronize while the generator is carrying part load at the reduced voltage. The benefit of this arrangement has been a greatly improved service due to a material reduction in the length of the interruptions.—*Committee on Electrical Machinery of A.I.E.E.*

Governors for Hydraulic Turbines

An important development is the adoption of motor drive for fly balls in place of the former belt drive. The success of the motor drive has been fully demonstrated and owing to its simplicity it is predicted that the motor drive will be very generally adopted in the future.—*William Cramp & Sons, Philadelphia, Pa.*

Ignition of Oil Heaters, Transformer for

Of special interest to radio-telephone engineers and enthusiasts is the development, for use with the ignition systems of oil heaters, of a transformer which successfully eliminates radio interference trouble, a serious objection to electric ignition in these devices heretofore. This transformer is provided with an internal magnetic blocking filter as well as low-voltage and high-voltage filters.—*Committee on Electrical Machinery of A.I.E.E.*

Insulators, Defective Location of

A device developed by our high-tension laboratory for testing live lines for defective insulators has been tried out in the field and adopted by the operating department.—*Hydro-Electric Power Commission, Toronto, Ontario.*

Insulators, Suspension, Grading Ring for

The grading ring or shield was first developed for use on very high voltage systems. On long non-shielded insulator strings the voltage does not divide evenly but about 25 per cent of the operating voltage appears across the line unit. The operating stress is thus about 25 per cent of the operating voltage on the line unit on a non-shielded string. The grading ring causes each unit to take approximately its share of the voltage and prevents corona at normal voltages. It also tends to even up surface stresses. Very long insulator strings have unstable characteristics similar to the multigap lightning arrester. If the line unit arcs, the whole string may arc over. The grading shield by evening up the voltages removes this instability.—*General Electric Company, Pittsfield, Mass.*

Light, Intensity of, and Speed of Vision

In the choice of amount of light needed for various types of industrial work, there are the so-called intensity factors which exert a strong influence on the benefit of increase of intensity of light. The two most important factors are size of object and difference in coefficient of reflection between object and background. Some experimental results of a study of these factors were presented at the last annual convention of the Illuminating Engineering Society.—*C. E. Ferree and G. Rand, Bryn Mawr College, Pa.*

Yoke Tester, Magnetic, for High Values of "*H*"

The new tester described and illustrated in the 1924 annual report has been in use throughout the year and has been found to facilitate enormously the testing of rods and bars for permeability at high magnetizations. It is possible to test specimens 25 cm. long up to $H = 3{,}000$. On shorter lengths of about 8 cm., using soft iron extension pieces, a value of $H = 5{,}000$ can be obtained. This extension of the range of magnetization attainable is particularly valuable in connection with the testing of the new cobalt-steels, for which a very high magnetizing force is required to give even approximate saturation.—*National Physical Laboratory, London, England.*

In Progress or Purposed

Coal, Liquefaction of

High-temperature carbonization of coal does not yield appreciable quantities of fuel oil or motor spirit, while low-temperature carbonization is not yet a commercial success and is of limited adaptability only. The complete liquefaction of coal by the Bergius or Bergin process promises to provide a satisfactory method for the conversion of coal into oil. Powdered coal is heated with hydrogen at about 450-500 deg. C. and 100-120 atmosphere pressures; in this manner almost the whole of the coal is converted into oil products—motor spirit, fuel oil and phenols. The solid residue amounts to but 5 per cent with brown coals and lignites and up to 15 per cent with bituminous coals. The process has been tried in a plant with a through-put of 20 tons of coal per day. For details see *Zeitschrift Vereines deutscher Ingenieure*, 1925, Vol. 69, pp. 1313 and 1359.

Heating, Metals for Electric

The executive committee has authorized the organization of committee B-4 on metallic materials for electrical heating to undertake: (1) The study of properties of such materials, including chemical, physical and electrical properties and to conduct suitable investigations; (2) the development of standard methods of test, and (3) the development of standard specifications.—*American Society for Testing Materials, Philadelphia, Pa.*

Insulators, Expansion of Cement in

The work is following two phases—namely, the prevention of volume changes of the cement and means of minimizing these effects by features of assembly. The work so far shows that the volume change of the cement is more important than the thermal characteristics of the porcelain and that failures of pin-type insulators attributed to the thermal characteristics were due to the effect of the cement action.—*Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.*

Insulators, High-Voltage, Made of Pyrex Glass

Years of intensive research have proved that Pyrex insulators have the required qualities for a good insulator, These qualities are: Low temperature rise with uniform temperature throughout; transparency, permitting ease of inspection; the material is non-hygroscopic; permanent and uniform dielectric strength; quick drying surface, and the ability to withstand concentrated power arcs. Several thousands of these insulators have been in service on the Montana Power system for about two years. Development work is proceeding on suspension and flange or stack-type units.—*Corning Glass Works, Corning, N. Y.*

Leather Belting

The following studies are being made: Arc of contact; the effect of center distance on transmitting capacity; the effect of pulley size on transmitting capacity; the effect on the belt's capacity of using a small pulley to drive a large one and *vice versa*, such as is commonly the case with belted motor drives; a study of the gravity idler, such as the Lenix drive; the effect of belt speeds up to 8,000 ft. per minute on the transmitting capacity of leather belting; relative power-transmitting capacity of belts on vertical, angular and horizontal drives. Pamphlets are available on the work already completed.—*Leather Belting Exchange Foundation, Sibley College, Ithaca, N. Y.*

Suggestions for Research

Dielectric Loss, Use of Calorimeter for Measurement of

Much thought has been placed on procuring a suitable comparator which could be used for standardizing any measuring outfit for dielectric power loss and power factor. No satisfactory means has yet been made applicable. As far as the author knows, no attention has been paid to the calorimeter method as being useful for such a comparator. Such a method was used early in the art in connection with measurements on capacitors and has since been successfully applied with satisfying results. Though the difficulties of such a measurement with cable samples are more severe than with capacitors, nevertheless it is felt that there is a field for such a measurement. —*E. S. Lee, in an A.I.E.E. paper presented at Niagara Falls in May*, 1926.

Insulator Rain Test, Resistivity of Water for

One of the tests to which high-tension insulators are subjected is a flashover when subjected to a stream of water simulating a shower. It appears that the electric conductivity of the water used has some influence upon the critical voltage. Hardly any data are available on conductivity of actual rain water, and the range of values should be ascertained in order to come nearer the actual conditions on test; or else an arbitrary conductivity value should be agreed upon for tests, as a standard, in order to make different results comparable.

Kenotrons, Electrostatic Shielding of

With very high voltages, proper electrostatic shielding exerts a considerable influence upon the characteristics of the tube, especially upon its internal voltage drop. For methods of tests and preliminary results, see *Archiv für Elektrotechnik*, 1926, Vol. 16, p. 13.

Welds, X-Ray Tests on

Tests made show definitely that the X-ray is capable of revealing such defects as gas pockets, oxide inclusions and cracks nearly parallel with the rays, but that with the methods employed there will be little if any indication of poor fusion. These apparent shortcomings may possibly be overcome by future advances in X-ray technique. For general application the apparatus should also be made much less cumbersome. For details see *American Welding Society Journal*, 1926, June, p. 50.

News of the Industry

Hirshfeld Outlines N.E.L.A. Committee Policy

The Engineering National Section of the National Electric Light Association met in Chicago on Wednesday to Friday, Oct. 13, 14 and 15. More than two hundred men attended the meetings. Each committee organized its work for the coming year. Chairman C. F. Hirshfeld outlined to the members the new policy of the association whereby each committee is organized on a continuing basis. He stressed the importance of technical committee work from the standpoint of system assembly as well as that of detail. Utility systems should now be developed on a plan basis, Mr. Hirshfeld said, and this conception should be remembered in the promotion of committee activities while each committee continues to function in its own field.

Two or three joint meetings were held, and there was an Engineering Section dinner on Thursday night. Major H. S. Bennion, the new director of engineering at headquarters, was introduced and received a cordial welcome, to which he responded briefly. The local committee in Chicago provided inspection trips, golf and other amusement for the visitors.

German Central-Station Men Welcomed in New York

At the Engineers' Club in New York on Friday, Oct. 8, a luncheon was tendered to eight German visitors, delegates of the Association of German Electro-Power Stations, who are in the United States to inspect its power plants and become acquainted at first hand with the practices of American light and power companies. Besides New York City, where the visitors visited the chief generating stations as guests of the local companies, their itinerary includes Boston, Niagara Falls, Buffalo, Detroit, Chicago, Milwaukee, Cincinnati, Pittsburgh, Philadelphia and other places. They will sail on the return journey for Europe on Nov. 6.

The delegation, which constitutes a "committee for high-pressure steam," is made up of Dr. H. F. Mueller, Berlin, chief of the literary department of the Association of German Electro-Power Stations; Dr. Ing. Xaver Mayer, Stettin, member Municipal Board; Director K. Merbitz, Siegen, director of electro-power stations, Siegerland; Dr. M. Krone, Dortmund, general manager of power stations in Westphalia; Dr. M. Fischer, Dortmund, director of power stations; Dr. W. Duhmer, Stettin, member Municipal Board; R. Krone of Dortmund, and Dr. Marguerre, Mannheim, director of power station. The luncheon was under the auspices of the Superheater Company, and the committee of welcome contained leading representatives of that company, the New York Edison, United Electric Light & Power and Brooklyn Edison companies, several other organizations and the electrical press.

John W. Lieb in welcoming the visitors observed that local conditions made it unsafe and unfair to draw comparisons between American and European practices. He said also that the requirements of mass production under certain conditions did not involve maximum thermal efficiency in generation. Response for the guests was made by Dr. M. Krone of Dortmund.

N.E.L.A. National Convention Again Goes to Atlantic City

The fiftieth annual convention of the National Electric Light Association will be held in Atlantic City, N. J., in the week beginning Monday, June 6, 1927. This announcement, just made from headquarters, is another recognition of the advantages offered by Atlantic City for conventions with the size and scope of that of the N.E.L.A. Last year's convention was also held in this coast resort, as were those of 1924, 1922, 1919, 1918, 1909 and 1906.

P. S. Clapp to Be N.E.L.A. Executive Head

His Wide Experience in America and Europe as an Electrical Engineer, Administrator and Officer—Post-War Service Took Him to Many Countries

FROM the headquarters of the National Electric Light Association comes the announcement that Paul S. Clapp of Washington, D. C., has been appointed executive head of the association. This appointment follows the acceptance by the executive committee

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P. S. CLAPP

of the resignation of M. H. Aylesworth, managing director, who, as told in the ELECTRICAL WORLD for Sept. 18, is to become president of the newly organized National Broadcasting Company, Inc.

Graduated from the Iowa State College at Ames in 1913 as a bachelor of science in electrical engineering, and ten years later attaining the professional degree of electrical engineer by award of his alma mater, Mr. Clapp has an excellent engineering groundwork for the post he is to assume. In September, 1913, he found his first employment in the Chicago factory of the Western Electric Company, where he familiarized himself with factory methods. In February, 1914, he advanced to the same company's engineering department in New York, remaining there until February, 1917, assisting in research work in connection with trials of the vacuum tube as an oscillator and amplifier, work which resulted in the first telephone conversation across the United States. Mr. Clapp was in charge of the station at Winnemucca, Nev., when the successful trial was made.

In February, 1917, Mr. Clapp became assistant purchasing agent of the Allied Machinery Corporation, a subsidiary of the American International Corporation, remaining until September of the same year, when he was commissioned a first lieutenant in the Signal Corps of the United States Army and became division signal supply officer of the Thirty-third Division at Camp Logan, Tex. Later, while in charge of the field trial and responsible for the final engineering approval of all radio and telegraph apparatus for airplanes, tanks and field sets at the radio laboratories at Little Silver, N. J., Mr. Clapp won promotion to a captaincy in the Signal Corps and was assigned by the War Department to organize and manage a factory in France for the assembly of all small-sized batteries used by the army. Complete plans for the factory were concluded, but the armistice halted the work before it was put into operation.

From December, 1918, to February, 1919, Mr. Clapp served on the peace commission in Paris as a member of the committee for the determination of damage in allied countries, and afterward he was affiliated with the American Relief Administration for Central and Southeastern Europe, which established and supervised the operation of telegraph and telephone service between various cities in Europe from which relief work was administered,

including cities in Austria, Italy, Poland, Germany, Jugoslavia, Roumania, Czechoslovakia and Hungary. After finishing that work Mr. Clapp for a year assisted in re-establishing cordial relations in the business interchange between American and western European industries and then sailed with Col. William Haskell and his original American Relief Administration party from New York to Russia. He supervised a feeding area containing 470,000 adults and children at Uralsk for nine months and afterward was in charge of special assignments at Tzaritan, Rostov and Moscow.

Concluding his work with the Relief Administration in February, 1923, Mr. Clapp traveled in Scandinavia and central Europe and then in Berlin to study languages, customs and conditions. Returning to this country, Mr. Clapp, who had aroused the interest of Herbert Hoover when the latter was in charge of the American relief work in the Old World, was appointed special assistant to the Secretary of Commerce in engineering, economic and commercial problems of the United States.

Eastern Inspectors Hold Two-Day Convention

Following its initial meeting last February, the Eastern Association of Electrical Inspectors held a convention on Wednesday and Thursday, Oct. 13 and 14, at the Pennsylvania Hotel, New York. This association, the outgrowth of the former Western New England Association of Electrical Inspectors, has the Atlantic seaboard for its territory, and already there are chapters representing New York, Philadelphia and western New England, under the respective chairmanship of F. N. M. Squires, Washington Devereux and J. P. Rohan. About 125 delegates registered, Philadelphia and New England being well represented, with some from Southern states.

An address by Thomas H. Day of the New England Insurance Exchange dwelt on fifty years of electrical inspection—past, present and future. The code question box, conducted by President Forsyth, proved of especial interest, fifteen queries coming up for discussion. On Thursday inspection was discussed from the viewpoint of the electrical manufacturer by D. Hayes Murphy of Hartford, from the viewpoint of the electragist by Secretary L. W. Davis of the contractors' association, from that of the municipal inspector by N. J. Kelly of New York, of the underwriters' inspector by W. W. Vaughan of Syracuse, and of the public utility by A. P. Good of the Commonwealth Edison Company, Chicago. Among other speeches—there were no papers—were one by T. C. O'Hearn, city electrician of Cambridge, Mass., on "The Municipal Inspector and Accident Prevention Rules," and one by Stanton S. Hertz, electrical engineer of the Copperweld Steel Company, New York, on the aims and values of the Eastern association.

A luncheon was tendered the delegates in honor of President Forsyth by the New York Electrical Board of Trade. C. L. Eidlitz was toastmaster.

Public Ownership Up Again

Oregon and California Vote Next Month on Measures to Put Respective States in Power Business

OREGON and California, as previously reported in these columns, will at the November election vote on measures designed to put those states into the power business. The object of the "California water and power act" is generally known, and voting upon it has become a biennial proceeding. Briefly, it provides for bonding the state to the amount of half a billion dollars and for the creation of a board of five which will have power to expend moneys up to this sum for the purpose of acquiring or constructing power plants, transmission systems and distribution facilities for the sale of electrical energy to the public.

The Oregon bill, which was patterned after the California measure, is known as the "Oregon water and power board development measure." It differs from the California bill principally in that the members of the original board of five provided for are named in the act itself, and instead of bonds of a definite amount, it provides for the issuance of bonds up to 5 per cent (at present $52,944,000) of the assessed valuation of the state. Both measures empower the respective boards they would set up to construct or acquire by purchase, lease, condemnation, gift or other legal means lands, water, water rights, easements and electrical energy, and also to construct and operate works, dams, reservoirs, canals, pipe lines, conduits, power houses, transmission lines, structures, roads, railroads, machinery and equipment and any other property necessary or convenient for the purposes of the act, and to do any and all things necessary or convenient for the conservation, development, storage and distribution of water and the generation, transmission and distribution of electrical energy and water for irrigation and domestic purposes. The Oregon bill has an exception to this clause which provides that no plant shall be purchased for a consideration of more than $500,000 until such purchase shall have been approved by a majority of the legal voters of the state at a general election.

Each act provides that bonds may be sold not only for the purpose of acquiring property and rights and for the acquisition, construction, development and completion of projects, but for operation and maintenance as well. Should the revolving fund created fail to contain sufficient funds to meet the expenses of the board, additional bonds may be sold to defray expenses. Both bills are constitutional amendments and will require a two-thirds vote for their passage at the Nov. 2 election.

Great Western Power's San Francisco Bay Cable

An 11,000-volt submarine cable will be laid in October across San Francisco Bay by the Great Western Power Company. This will be the fifth transbay cable of the Great Western bringing hydro-electric energy from the Feather River into San Francisco, and it will be approximately 41,000 ft. in length, stretching from Pier 39 to Point Isabel on the Contra Costa shore. The cost of this cable and the necessary equipment and tie lines at each shore end is estimated to be more than $275,000.

The new cable, manufactured by the American Steel & Wire Company, was shipped to San Francisco from the factory in the East in eight cars and is now being spliced into one length and placed aboard a barge preparatory to laying it. The cable has a capacity of 12,000 kw., and its three conductors are of 500,000 circ.mil capacity. It has a diameter of 4¼ in.

Hortonia Power Company Passes to Insull Interests

The Hortonia Power Company of Brandon, Vt., which went into receivership several months ago, has passed at receiver's sale to the Insull interests at the price of $1,100,000. This company, which operates seven hydro-electric generating plants with a total rating of 10,000 kw., besides small auxiliary steam plants, and has 165 miles of 4,400, 3,200 and 1,320-volt transmission lines, serves southeast and south central Vermont and exports energy to Mineville and Port Henry, N. Y.

Lamp Price-Fixing Case Up in Supreme Court

Violation of the Sherman anti-trust law on the part of the General Electric Company and the Westinghouse Electric & Manufacturing Company is charged by the United States government in the case appealed by it which came before the United States Supreme Court on Wednesday of this week, when argument for both sides was heard.

The government insisted that the General Electric Company, after agreeing in 1911 to a decree under which it would not fix prices at which jobbers and retailers must sell its electric lamps, had adopted the present plan of converting the jobbers and retailers into agents to accomplish the same purpose. The government held that the company merely had changed the form of price fixing by putting the jobbers and retailers on a commission basis as agents instead of selling directly to them on a profit basis. The government also held that the license agreement under which the Westinghouse company was permitted to manufacture and sell the patented lamps constituted an unlawful combination in restraint of trade.

The accused companies maintain that manufacturers of patented articles have the right to control sales prices. The General Electric Company argued that the plan complained of had been in effect for fourteen years before the government had brought the proceedings and that it had benefited the consumer. The company insisted that its patent monopoly gives it the right to do as it pleases with its lamps and that it was clearly within the law when it determined the price at which it would sell to the public, the jobbers and retailers never coming into ownership of the lamps but merely acting as agents.

A.E.S. Meets at Washington

Electrochemical Engineers Hear Papers of Technical Interest—Weston Made Honorary Member

THE fiftieth meeting of the American Electrochemical Society was held in Washington, D. C., Oct. 7, 8 and 9. The principal feature of the technical program was a symposium on materials for extreme conditions in the electrochemical industries, prepared under the direction of Dr. H. W. Gillett. The papers presented in this symposium dealt principally with metals and refractories. A résumé of previously published information on metals to resist corrosion or high temperatures was given by H. J. French, who gave data on the industrial use of aluminum, copper, nickel, lead and their alloys, tin, silver and zinc. Ferrous alloys, particularly nickel-steels and high-chromium steels, were also discussed. Stanley L. Norwood spoke on the welding of high-chromium alloys, emphasizing the difficulties encountered in welding alloys containing more than 10 per cent chromium. Brittleness in the weld and in the base metal adjacent thereto can be overcome by the addition of 8 per cent nickel to high-chromium alloys. The addition of 2 per cent silicon increases resistance to sulphur products. Materials of construction for nitrogen fixation were discussed by J. G. Thompson, who pointed out the problems encountered in the synthesis of ammonia at pressures up to 1,500 atmospheres. Future progress will require new materials if the trend continues toward higher pressures in combination with high temperatures.

The thermal insulation of various types of electric furnaces was discussed in a paper by L. M. Hartmann and O. B. Westmont. The authors gave data on the thermal conductivity of fused alumina, fused magnesia, fireclay and a high-temperature insulating refractory, silicon carbide and silica. Tabulated data were given on the temperatures, heat losses and heat capacities on thirteen types of electric furnace linings.

The use of recrystallized silicon carbide as a refractory material for electric furnaces used in firing porcelain at high temperatures was reported by F. A. J. FitzGerald. Refractories for induction furnaces were discussed by M. Unger. Magnesium oxide more nearly fulfills the requirements than any other single refractory. George E. Merritt reported the measurement of the thermal expansion of some fused oxides. In the case of a mixture of one-to-one molecular proportions of thoria and zirconia he concluded that a chemical combination takes place, yielding a special refractory of great promise. Refractories for melting pure metals—iron, nickel and platinum—were discussed in a paper by Louis Jordan, A. A. Peterson and L. H. Phelps. The properties of vitreous silica and vitreous quartz which make them suitable for chemical and electrical applications were described by W. W. Winship.

At an evening session honorary membership in the society was conferred upon Edward Weston in recognition of his contributions to electrochemistry. The next meeting of the society will be held at Philadelphia in April.

Municipal Electricians Will Help to Set Standards

The International Association of Municipal Electricians at its recent meeting in Asheville, N. C., went on record as favoring the highest possible degree of co-operation by that body in the improvement of interior wiring standards as embodied in the National Electrical Code. This declaration was contained in the following resolution:

Be it resolved, that this association hereby directs the code sub-committee of its standardization committee to proceed immediately with the following program:

1. To ascertain from each member local wiring practices, whether written or unwritten, which differ from the National Electrical Code, whether as additions or changes.
2. To study, compare and select from such changed practices those which in the judgment of the committee are suitable and timely for inclusion in the national standards as supported by this association.
3. To reject and support local rejection of such rulings as in the judgment of the committee are not valid for use as additions or changes from national standards.
4. To present these findings to the association as made and to present them also to various co-operating agencies as made.
5. To utilize in these connections the services of the electrical field secretary of the National Fire Protection Association, as may be found practicable.
6. To correlate this program with the association's representation on the electrical committee, N.F.P.A., by having it representative on the electrical committee always a member of its code sub-committee.

For the purpose of carrying out these duties, be it resolved, that this committee be given powers to conduct this program from month to month during the association year.

Ritchie Invites Political Investigation of Conowingo

Governor Ritchie of Maryland has in a formal statement invited his political opponents to appoint a commission to conduct an investigation into the circumstances surrounding the state's approval of permits for the development of the Conowingo hydro-electric project. In addition, the Governor offers to place at once at the disposal of such a commission for its investigation "every facility of the state." This offer was made by the Governor in reply to an address by Addison E. Mullikin, Republican gubernatorial candidate, and to the Republican platform, which demanded "an investigation of this 'deal' by an impartial and unpaid commission."

Officials Sum Up the New Plans for Carillon Site

Official declaration of the conditions of the leasing of the Carillon waterfalls on the Ottawa River in Canada by the Provinces of Quebec and Ontario to the National Hydro-Electric Company were divulged after the signing of the contract on Oct. 7. A summary shows that Quebec enters into an agreement with the National Hydro-Electric Company, Limited, a company incorporated at Ottawa in 1910 and operating a hydro-development at Carillon since 1913, to allow the extension of the present development. The lessee is authorized to lease the rights possessed by the province on the bed of the Ottawa River at Carillon for a period of sixty years to the National Hydro-Electric Company. The company must start its development on or before Dec. 1, 1927, and before 1932 100,000 hp. must be developed.

Since the announcement of the agreement there have been rumors throughout eastern Canada that the proposed development will interfere with the early development of the St. Lawrence River's power resources. This contention has been stoutly denied by Premier Ferguson of Ontario. "We are merely adding to our power resources," he said. With respect to the action of the new Dominion government in rescinding certain contracts made recently by the late Conservative administration in connection with the development at Carillon, Mr. Ferguson said that he could not say what the effect would be. The attitude of the Dominion government on the whole matter has, in fact, not yet been announced. Its control of navigation is held to give it power to upset the interprovincial agreement.

New Jersey to Co-operate

State Labor Department to Hold Its Electrical Rules in Abeyance and Confer with Industry Code Makers

FEAR that independent action by the Department of Labor of the State of New Jersey to promote safety in electrical installations might lead to similar action by other states and thus militate against the adoption of a uniform code was largely dissipated when the State Commissioner of Labor, Andrew F. McBride, at a meeting held in Trenton on Monday, Oct. 11, stated to representatives of the industry that the electrical safety rules instigated by his department were primarily drafted with the idea of conserving human life, that it was not his desire to harass the industry unnecessarily and that he would be glad to co-operate with it and with the various code-making bodies so as to prevent independent state action if the results can be accomplished in a national way. Commissioner McBride agreed to hold the enforcement of the rules in abeyance, except in the most flagrant cases, until a committee from the industry shall have further opportunity to confer with his department. The electrical safety rules referred to were issued by the Bureau of Electrical and Mechanical Equipment, of which Rowland H. Leveridge is chief. No doubt the Department of Labor will in due course issue the proper instructions covering the course which it is pursuing.

Twenty men of the industry, under the leadership of a committee including Harry B. Kirkland of the Society for Electrical Development, S. L. Nicholson, Howard R. Sargent and C. A. Bates, were present at the discussion of the new rules with Commissioner McBride. These men represented utility companies and various code and safety committees now engaged in a national study of problems

similar to those covered by the New Jersey rules. They put forth a plea for uniformity in rules and for national uniform action concurred in by all parties at interest as a logical, orderly substitution for independent state action. Important points brought out by the men who spoke for the industry were the national work now in progress by various committees on grounding and the difficulty of proper interpretation where independent rules exist.

The bureau will through this committee, which will confer with it, follow the activities of the various committees now working on a solution of the safety problems involved in the grounding of apparatus. Such committees include the Article 5 committee, which will hold a three-day meeting at Atlantic City next week which Mr. Leveridge has promised to attend. One of the questions being discussed by this committee covers approved types and systems for electric wiring. Some of the other committees are the Article 9 committee on grounding electrical circuits, the committee on the control of portables and the safety rules committee.

Another Bid for Muscle Shoals in Preparation

Announcement is made in the daily press that C. Bascom Slemp, former secretary to President Coolidge, is organizing a company to make a proposal for the lease of the Muscle Shoals power plant, to be presented to Congress in December. According to Mr. Slemp, the plan calls for a 50-year lease of the government plant for manufacturing nitrates and development of power and by-products. It would involve an investment of at least $20,000,000 and possibly four times that amount. The new company would promise to manufacture a great amount of nitrates. Mr. Slemp declined to disclose those interested in the project, but said it was being backed by New York financiers and would be known as the Farmers' Federated Fertilizer Corporation.

Projects Before the Federal Power Commission

The Eastern Oregon Light & Power Company of Baker, Ore., has applied to the Federal Power Commission for a preliminary permit covering a project on Grande Ronde River at a point 2 miles northwest of Wenaka. It is planned to install two 4,500-hp. units.

The Western States Utility Company of Malad City, Idaho, has applied for a license covering its partly constructed project on Birch Creek in Bannock County, Idaho. The construction thus far undertaken is covered by a Forest Service permit. One dam and reservoir have been constructed and another dam and reservoir are contemplated. The present installed equipment develops 410 hp.

The Alturas Electric Power Company of Alturas, Cal., has applied for a license covering its constructed plant on Pine Creek. The primary power involved is 350 hp.

The Nevada Valleys Power Company of Lovelock, Nev., has applied for a license covering a transmission line from its Tahonton power house. The line will be 29 miles long and will connect with the line of the Truckee River General Electric Company.

The Pacific Gas & Electric Company has applied to the Federal Power Commission for an amendment to its Salt Springs license which will permit the building of a reservoir on Deer Creek, thereby increasing the capacity of its Tiger Creek plant.

Joseph Whitman of New York has applied for a preliminary permit covering a 1,200-hp. development in Sabrino Canyon, near Tucson, Ariz. It is improbable that the commission will act on this application as the project is in the Colorado River Basin.

The Deschutes Power & Light Company of Bend, Ore., has applied for a license to cover 17 miles of 66,000-volt transmission line which is to connect its Bend power house with the substation of the Deschutes Power Company at Redwood.

The village of White River in South Dakota has applied for a license covering a 115-hp. project on Little White River.

Richardson Boosts Swing-Johnson Bill

Governor of California Calls Special Session of State Legislature to Ratify Six-State Colorado River Compact Unconditionally as Aid to Boulder Dam

GOVERNOR RICHARDSON of California last Tuesday called a special session of the California Legislature to convene in Sacramento Oct. 22 for the purpose of ratifying the six-state Colorado River compact. This move was a complete surprise. The extra session will probably last one day only. Governor Richardson points out in his call that Congress will meet in December and that any action by that body on the Swing-Johnson bill, which puts the federal government behind the proposed Boulder Canyon dam, is contingent upon unconditional ratification of the compact.

The California Legislature ratified the compact in 1925 with reservations. This procedure, according to Governor Richardson, "was practically a nullification and was taken against my advice." The Governor reminds the people of California that the six-state pact, which contains all the provisions of the original seven-state compact, agreed on at Santa Fé, N. M., by commissioners from the seven states in the Colorado basin and Secretary of Commerce Hoover, has been unconditionally ratified by the States of New Mexico, Nevada, Wyoming, Utah and Colorado. The seven-state pact was ratified unconditionally by the legislatures of all the foregoing states and by the California Legislature in 1923, Arizona alone declining to ratify. The six-state compact was drawn for the purpose of enabling the federal government to proceed without delay to erect structures in the Colorado River designed to protect the Imperial and Palo Verde valleys from flood danger, to assure an adequate and regulated supply of water for Arizona lands, to provide additional domestic water for the cities of southern California and to develop hydro-electric power.

"Nothing should be left undone," says Governor Richardson, "by this state calculated to encourage prompt congressional approval of the great river project. To delay until next January or February action by the California Legislature rescinding its nullification of the six-state compact will probably result in continued refusal of Congress to act, or even in the rejection of the plan, and thus add to the complication and peril that now exist."

Governor Richardson was defeated in the primaries held in August for renomination and therefore goes out of office on Jan. 1, 1927.

Colonel Cooper on Russia's Hydro-Electric Project

Returning to America after spending three or four weeks in Russia and traveling 5,000 miles in that land, during which trip he examined the hydro-electric project on the Dnieper River that the soviet government is contemplating, Colonel Hugh L. Cooper told the press that the plan includes railway and other facilities that will cost about $75,000,000 and develop about 600,000 hp. His recommendation that $60,000,000 be spent on it in five years has been adopted. Colonel Cooper has been asked by the soviet government to become consulting engineer for the work, and he hopes to be able to do so.

Herr, Addressing Contractors, Calls for More Advertising

Adequate advertising is essential to introduce new electrical apparatus to the public, President E. M. Herr of the Westinghouse Electric & Manufacturing Company told the Pennsylvania State Association of Electrical Contractors and Dealers at its annual meeting in Philadelphia last week.

"It is estimated that during the decade from 1920 to 1930," said Mr. Herr, "the electric light and power companies will spend approximately six billion dollars for new equipment, an amount so huge that it is almost impossible to appreciate its magnitude. By the expenditure of this money the gain in business during this period will undoubtedly more than double the number of central-station customers. Pioneering effort will, however, continue to be a necessary factor in the introduction of new apliances to the public, and for this adequate advertising is essential."

Muscle Shoals Power Sales

Explanation of Basis on Which the Agreement with Alabama Power Company Was Reached

WITH the idea of keeping the record straight and of correcting certain inaccuracies in published statements concerning the negotiations for the sale of Muscle Shoals power, it is pointed out that the objection to the original plan devised by Major Max Tyler was based primarily on rates rather than on operating conditions. In the original scheme the following operating condition was proposed:

"The Alabama Power Company shall at all times utilize power from Wilson Dam instead of steam power from its own or leased stations up to the capacity of the transformer stations now installed or that may be installed at Wilson Dam, whenever the flow of the Tennessee River will carry the transformer station at full load, and whenever the Tennessee River falls below that capacity the power company shall take Wilson Dam power so as to utilize fully the flow of the river."

In the revised plan the power company agreed to the following condition:

"It is understood that the Alabama Power Company will utilize the available hydro power at Wilson Dam to a maximum in replacement of steam, and the company normally will not operate its steam plants when Wilson Dam hydro power is available, except as may be necessary for voltage regulation, protection of its customers and in case of breakdown or line interruptions, until the Wilson Dam plant is carrying a minimum of 80,000 kw."

The rates proposed by Major Tyler and by the engineering department and rejected by the power company, it is explained by spokesmen for the Corps of Engineers, were based on the market price of coal. The power company then permitted the engineer department to examine its cost records of operation of its steam plants and of its coal mines. It appeared that the power company had expanded its mining operations and was prepared to supply the coal requirements of its own and leased steam stations. This made it necessary to figure the saving to the power company through the use of hydro-electric power from Wilson Dam on the basis of the mining cost of coal in the company's mines plus freight, and on this basis new rates were computed and agreed to.

Indiana Rates Under Its Neighbors', Commission Says

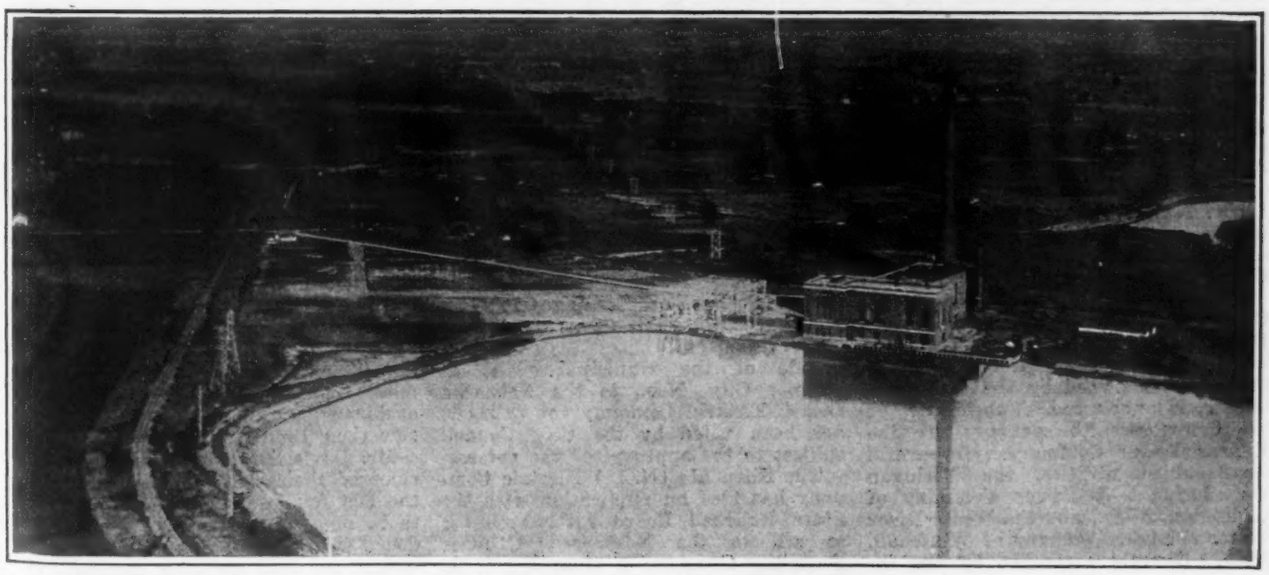
Electric rates for both domestic and industrial consumers are lower in Indiana than in any of the three principal neighboring states of Ohio, Illinois and Michigan, according to figures contained in a report to John W. McCardle, chairman of the Indiana Public Service Commission. The report was compiled from data secured by officials and employees of the Indiana commission. According to it, two types of service were included in compiling the comparative rates for electrical energy in the four states. The report shows that 26 cities in Indiana, with a total population of 47,720, have lower average monthly industrial bills than either of the other three states and have lower average domestic monthly bills than either Illinois or Michigan and, on a population basis, a much lower rate than Ohio.

The two classes include class A, known as the residence and commercial rate, and class D, the rate for large industrial consumers. It is pointed out that, other things being equal, the greater the consumption of any utility service the lower the rates are and that high consumption naturally depends to a considerable extent upon large population. With this in view, Mr. McCardle points out that a survey of an equal number of cities in Ohio, with an average population of 121,864, almost three times the average of the 26 Indiana cities, shows an average rate only 2 cents lower for domestic purposes. Similarly, it is shown that in both Illinois and Michigan, in 24 and 18 leading cities of these states respectively, with much higher population than the Indiana cities, higher electric rates prevail than in Indiana, contrary to the assumption that the greater the population the lower the rate.

The charges for electric service in the report are computed for typical monthly bills for both class A and class D service, using the rate schedules in effect in each city considered. In determining the average size of bills for different classes of service a total of 88,587 consumers was considered, with the result that the class A assumed average monthly consumption is 31 kw.-hr. and that the class D assumed average monthly consumption is 35,000 kw.-hr., with an assumed average monthly demand of 175 kw.

In a summary of the electric rate comparisons, it is shown that the Indiana cities have a class A average monthly bill of $2.86 and a class D

Colorado Public Service's Valmont Plant and Reservoir Pictured from Air



TAKEN from an airplane, this photograph of the Public Service Company of Colorado's Valmont steam-electric plant near Boulder, Col., shows the transmission lines extending in the direction of Denver and to the Boulder Canyon hydro-electric plant. The lake in the foreground has a 120-acre surface and a storage capacity of 2,000 acre-ft. Provision has been made for building a dam when additional cooling area is required.

Installation of the plant's second unit is now under way, and it will probably be in operation in October. The first unit has a rating of about 22,500 kw. and the second unit will bring the plant's capacity up to 50,000 kw. This second unit, a product of the General Electric Company, is said to be the largest steam turbo-generator between the Missouri River and the Pacific Coast. Its installation cost will be approximately $650,000. The original Valmont installation and buildings cost $6,000,000, and it is estimated that when all units are completed the investment will reach twice that sum. The plant ranks with the largest consumers of powdered lignite coal.

monthly bill of $779.03, while surveys from other states show: Ohio, 26 cities, average population 121,964, class A bill, $2.84; class D bill, $791.31. Illinois, 24 cities, average population 164,423, class A, $3.31; class D, $815.43. Michigan, 18 cities, average population 119,646, class A, $3.10; class D, $790.68.

Purchases and Mergers

New England Power Association Gains Control of Narragansett Company—Associated Gas Acquires New Plants in Pennsylvania—Other Transactions

AFTER several weeks of negotiation and controversy control of the Narragansett Electric Lighting Company has, by sale of the majority of the stock, passed to the New England Power Association. An account of this important transaction will be found on page 830 under "Financial and Corporate," in which department the efforts of Bodell & Company of Providence and other bankers to obtain control of the Narragansett company for the purpose of merging it with the United Electric Railways Company of Providence—a project in which New England Power Association interests were actively concerned—have been noted from week to week.

Acquisition by the Associated Gas & Electric Company of several additional light and power properties in western Pennsylvania is confirmed. Chief among these are the Meyersdale Electric Light, Heat & Power Company and its affiliated companies—the Citizens' Light, Heat & Power Company, Garrett Electric Light, Heat & Power Company and Summit Township Electric Light, Heat & Power Company. The larger communities served by these properties are Meyersdale, Garrett, Elks Lick and Salisbury in Somerset County, Pa., and Grantsville in Garrett County, Md. The properties are already interconnected. In addition, the Associated system has acquired other properties just north of this section, including the United Light, Heat & Power Company, operating in the Boroughs of Hooversville and Stoyestown and the Township of Jenner; the Wayside Electric Company, serving the Township of Quemahoning, Shade, Stoneycreek and the Borough of Shanksville, and the White Oak Light, Heat & Power Company, serving Holsopple, the Borough of Benson and Davidsville, all in Somerset County.

Establishment of the Inland Power Company to consolidate the Interstate Electric Corporation and the Commonwealth Light & Power Company, holding concerns owned by the Fitkin interests, is announced. Subsidiaries of the Commonwealth company are the Kansas Power Company with several small allied utilities, the Michigan United Light & Power Company of Ludington, Mich., and the White River Power & Light Company of Whitehall, Mich. Directly controlled by the Interstate corporation are electric utilities in Blytheville, Ark.; Cheboygan and Boyne City, Mich.; Ellsworth, Downs, Dodge City, Great Bend and Hoisington, Kan., and Chillicothe and Trenton, Mo. Commission approval of the merger with the Michigan United Light & Power Company of the White River Power & Light, Boyne City Electric, Boyne River Power, Michigan Public Service, Elk Rapids Electric and Grayling Electric companies, applied for several months ago, has recently been given.

The Common Council of Pompton Lakes, N. J., has accepted the bid of the Jersey Central Power & Light Company, a subsidiary of the National Public Service Corporation, to purchase the Pompton Lakes hydro-electric plant, subject to a referendum of the voters at the November election. The Jersey Central has now a competing plant at Pompton Lakes.

The Lake County Water & Power Company, operating a hydro-electric plant which serves Kelseyville, Cal., and adjacent territory, has been authorized by the California Railroad Commission to sell its system to the California Telephone & Light Company, a subsidiary of the Pacific Gas & Electric Company.

The City Commissioners of Beatrice, Neb., have taken preliminary steps to take over by purchase the property of the Gage County Electric Company, which has book assets of $422,000, and to start condemnation proceedings to acquire the distribution system in the city of the Nebraska Gas & Electric Company, which also owns the gas plant. It proposes issuing revenue bonds that are not a charge upon the property of the city, but which are to be retired out of the revenues of the lighting plants acquired. The limit placed by the ordinance adopted is $920,000. The city owns its own plant, and this has recently served as a standby for the Gage County company, which supplies by wholesale the energy for street lighting. A year ago the voters refused to ratify a proposal to sell the city plant to the Nebraska company. The Gage County company owns three water-power developments along the Blue River south of the city and was financed by the Black Brothers Milling Company, which recently set it up as a separate corporation.

Sale of the municipal plant at Pawnee City, Neb., to the Nebraska Gas & Electric Company for $120,000 has been voted by the City Council subject to the approval of the voters.

The Ellendale (N. D.) Electric Company has filed an application with the State Railroad Board for permission to sell to the Northwest Utilities Securities Company of Mobridge, S. D. The value of the property is put at $192,000.

The Couch interests have offered $225,000 for the light and water plant of Yazoo City, Miss., which is through the City Council considering the sale of the plant.

The Pekin (Ind.) Light Company has been sold to the Middle West Utilities Company.

Wigginton E. Creed Addresses Bankers' Association

An item on the program of the annual convention of the American Bankers' Association held at Los Angeles last week was an address by Wigginton E. Creed, president of the Pacific Gas & Electric Company. Mr. Creed deplored the fact that business should depend so much on the whims of Congress. "It is to me a terrifying thing that great business leaders must say that the prosperity of the American people depends upon what Congress does," he said. "There is a profound relation between government and social and economic progress; no one need deny or question the fact. But if we keep our government geared to American institutions we need not suffer the terror that chills us when legislators meet.

"It was to me an equally terrifying thing that the Mellon tax program, meeting the wishes of the public mind and backed by the whole force of the executive branch of an administration selected overwhelmingly by the people, was yet held up an unconscionable time by the legislative methods we have allowed to grow up at Washington. In California one must go in some way before twelve different commissions, boards and officers fully to organize an irrigation project. Bureaucracy and bloc legislation menace our free institutions."

Isolated Electric Plants in Nebraska Dwindle

A survey just completed by Secretary Horace M. Davis of the Nebraska Section of the National Electric Light Association discloses that the marked tendency on the part of towns operating small electric generating plants to discontinue them and to purchase energy from the private companies operating large central stations and distributing energy over long transmission lines is quite as prevalent in Nebraska as in other states.

These figures show that in 1920 Nebraska had 528 incorporated cities and towns, of which nearly 300 were served by individual electric plants. Three years later the number depending wholly or in part upon transmission line service was 334. Including unincorporated villages and certain organized agricultural centers, there are now more communities electrically served than there are incorporated towns, and more than 400 of these rely almost exclusively on energy purchased outside their limits.

Mr. Davis lists 144 towns that have changed their source of supply within the last five years and adds that it is to be noted that the number of abandoned stations has grown most rapidly within the last eighteen months. Of the total number 96 were municipally owned and 48 privately owned. The list does not include towns now served at wholesale from municipal stations in Fremont, Fairbury, Falls City and other cities. Of the abandoned plants three were water-power stations, one a combination of water-power and steam, three oil and steam, 45 steam and 92 oil stations.

Briefer News

Weleetka, Okla., to Have Generating Station.—Construction of a new generating station on the Canadian River at Weleetka, with an initial capacity of 15,000 kw., has been started by the Oklahoma Power Company. The new plant will serve a group of communities in the vicinity of Okmulgee and Henryetta.

Bond Issue Sought for Jacksonville Municipal Plant.—An election will be held at Jacksonville, Fla., on Oct. 26 to pass upon the issue of $2,000,000 in bonds, three-fourths of which will, if authorized, be spent on the municipal electric plant. A new 25,000-kw. turbo-generator and three 1,500-hp. boilers are to be added to the equipment under the plans. It is predicted that the peak load of existing equipment will be reached next year.

Rochester Company Carries Cable Through 7 Miles of Bedrock.—Installation of a 7-mile power cable which stretches through bedrock from Driving Park Avenue, Rochester, to Charlotte, N. Y., and has a capacity of about 6,000 kw., has just been completed by the Rochester Gas & Electric Corporation. The cable was constructed at a cost of $60,000 and was built to serve both homes and industries.

Mr. Prager Still President of Rocky Mountain N.E.L.A. — While, as announced in the ELECTRICAL WORLD at the time, W. C. Sterne was elected president of the Rocky Mountain Division, N.E.L.A., at its recent Glenwood Springs convention, it should have been made clear that his term does not begin until July 1, 1927. The Rocky Mountain Division elects its officers ten months in advance, and Arthur Prager of Albuquerque, N. M., elected in 1925, is still president.

Kentucky Utilities Company Will Build New Hydro Plant.—Plans for a new hydro-electric generating station on the Kentucky River have been announced by the Kentucky Utilities Company. The new station, which will have an estimated output of 10,000,000 kw.-hr. a year, will be erected by the Kentucky Hydro-Electric Company, a subsidiary of the Kentucky Utilities Company. Preliminary work has been started, and actual construction will begin in the spring. The new station will be about 3 miles from the Dix River Dam.

Westinghouse Transformers, Shipped to Boston, Require Four Cars Each.—Two self-cooled transformers recently shipped to the Edison Electric Illuminating Company of Boston from the Sharon works of the Westinghouse Electric & Manufacturing Company were each rated at 25,000 kva., three-phase, 120,000 volts. They are of record size for such equipment. Each transmormer weighs 120 tons, including the oil, and is so large that it was necessary to divide the tank into two parts to get it within railway clearances. The transformer proper was shipped in oil in a separate shipping tank. The radiators were removed from the tank and shipped separately. Each transformer, therefore, required four standard cars to transport it from the factory to its destination.

Logansport (Ind.) Municipal Plant Objects to Cutting Rates.—The city of Logansport, Ind., has entered suit against the Indiana Public Service Commission to enjoin an order requiring a cut in the rates of the Logansport municipal electric light plant. The city alleges that the order is contrary to the constitution of the state, that the Public Service Commision act does not affect municipally owned utilities and that the city has a right not only to an adequate return on the investment but also to an amount equal to the taxes which a privately owned concern would pay.

Settlement of Potomac Electric Power Valuation Suit Attacked by Government.—The United States government in association with Edwin W. Davis, a private consumer, has asked leave in the Supreme Court of the District of Columbia to intervene in the valuation suit of the Potomac Electric Power Company against the Public Utilities Commission of the District. Mr. Davis and the Controller-General both ask the court to permit them to attack the validity of the consent decree under which the company divided with the consumers an impounded fund of $6,000,000. Mr. Davis wants an additional $39 as his share of the fund allowed to be retained by the company, and the government says it is entitled to an additional $200,000. The company maintains that no valid reason is offered for reopening or vacating the consent decree.

Coming Meetings of Electrical and Allied Societies

[A complete directory of electrical associations, with their secretaries, is published in the first issue of each volume. For latest list see ELECTRICAL WORLD, July 3, page 50.]

Electrical Supply Jobbers' Association — Atlantic City, Oct. 18-22. F. Overbagh, 411 South Clinton St., Chicago.

Electric Power Club—Briarcliff Lodge, Briarcliff Manor, N. Y., Oct. 25-28. S. N. Clarkson, B. F. Keith Bldg., Cleveland.

National Safety Council — Detroit, Mich., Oct. 25-29. W. H. Cameron, 168 N. Michigan Ave., Chicago.

National Association of Railroad and Utilities Commissioners—Asheville, N. C., Nov. 9-12. J. B. Walker, 270 Madison Ave., New York.

American Engineering Council—Administrative board, Ithaca, N. Y., Nov. 11 and 12. L. W. Wallace, 26 Jackson Place, Washington, D. C.

American Institute of Electrical Engineers — Regional meeting, New York, Nov. 11-12. F. L. Hutchinson, 33 West 39th Street, New York.

National Electrical Credit Association—Philadelphia and New York City, Nov. 12. F. P. Vose, 1008 Marquette Bldg., Chicago.

Empire State Gas and Electric Association — Electric Meter Section, Hotel Seneca, Rochester, Nov. 15 and 16. C. H. B. Chapin, Grand Central Terminal, New York.

American Welding Society — Buffalo, Nov. 16-19. M. M. Kelly, 29 West 39th Street, New York.

American Society of Mechanical Engineers—New York, Dec. 6-9. C. W. Rice, 29 West 39th St., New York.

Aërial Surveys Indicate Water-Power Possibilities of Alaska.—A report lately received from the Navy Aërial Survey expedition operating in Alaska states that a large lake, locally known as Lake Grace, has been shown by photographic work to hold excellent possibilities for the development of great water power. It was to obtain such information about a heretofore nearly inaccessible country that the navy expedition was sent to Alaska to cooperate with the Department of the Interior. The expedition mapped fifteen islands and the Cleveland peninsula, as well as a part of another large island, in two days. Two daily flights are made by two planes working together. By this means a territory is mapped in a few days that would take years of work by the old methods of surveying, and a continuous photograph is obtained of the land and water.

Permit Granted for Oklahoma's Big Hydro Project.—A step toward realization of the plan for the hydro-electric development of the Grand River in the northeastern corner of Oklahoma was taken last week when a permit was granted by the Oklahoma State Irrigation, Drainage and Reclamation Commission to James F. Robinson of Miami, Okla. As previously noted in these columns, the plans for this development are on a very large scale and would, it is said, cost $24,000,000 to carry out, producing 274,000 hp. Four dams would be built in Mayes, Delaware, Craig, Ottawa, Wagoner and Cherokee Counties, creating reservoirs covering 60,000 acres. The first and largest of the dams would produce 140,000 hp., the promoters say, and cost $16,000,000. The design is to supply power to Missouri and Arkansas as well as to Tulsa, Muskogee, Miami and other Oklahoma cities. By the terms of the permit one-fifth of the work must be completed within two and a half years and all of it in five.

Another New Plant for Texas Panhandle.—The Southwestern Public Service Company of Carlsbad, N. M., has purchased 25 acres adjoining Amarillo, Tex., upon which it will immediately construct an electric power plant, the first unit of which will cost $1,500,000. The completed plant may eventually cost $15,000,000, according to L. L. Ferree, district manager of the company. "The company is showing its faith in the rapid growth and development of Amarillo and the Panhandle," said Mr. Ferree. "The present plant is of ample size and capacity to provide for the requirements of the town for some time to come, but the unusually rapid growth of business makes it obligatory to provide additional service for the future. The first unit will have a capacity of 5,000 kw., and the completed plant a capacity of 50,000 kw. Amarillo is now using approximately 5,000 kw. a day. The new power house will be of steel, concrete and brick. We are now completing a transmission line to Panhandle and Pampa, which will be

supplied from this station. We also have in contemplation the extension of additional lines into the oil field."

St. Louis Has 300,000-Cp. Air-Mail Searchlamp.—The 36-in. shaft of light thrown out by a 300,000-cp. revolving searchlamp 19 ft. above the top of the Southwestern Bell Telephone Company's new office building at Tenth and Pine Streets, St. Louis, may be seen within a radius of 150 miles by airmen flying at night. The apparatus received its first trial on Oct. 1. Eighteen thousand watts are required to operate the searchlamp for an hour. The lamp has two speeds, either two or ten revolutions per minute. It was manufactured by the General Electric Company. The searchlamp was designed to aid night air-mail fliers and is the largest of its type manufactured.

Illinois Floods Give Lincoln Plant Hard Fight.—The Illinois Public Utilities' Company's generating plant at Lincoln, Ill., purchased last year from the Lincoln Water & Light Company, was the center of the most disastrous flood in the history of the community during the recent freshets in that state, and despite the dikes built to protect the plant, the village was without light for a period of 27 hours, except for some service from an old plant at Mount Pulaski. The water rose 12 ft. above the first-floor level of the plant, and it was necessary to reinforce the walls by 10,000 sacks of sand. B. P. Hallock, division superintendent, directed the emergency work which saved the plant from threatened destruction.

Competition in Nebraska Towns.—The Western States Public Utilities Company has asked the Nebraska Railway Commission for authority to issue, through its subsidiary, the Hartington Electric Company, $75,000 of bonds to be sold at 93 and $50,000 stock to finance the construction of a Diesel-engine plant at Hartington, Neb., which is already served by the Tri-State Utilities Company. The city is to purchase the proposed plant on long-time terms. It was testified that in the town of Bloomfield, where similar competition has been permitted, the city plant has obtained virtually all the business, and the promoters of the Hartington plant expect the same thing to happen there. Each place has about 1,500 people.

Construction Begins at Paugan Falls, on the Gatineau.—Construction of the big power plant of the Canadian International Paper Company at Paugan Falls, on the Gatineau River, in the Province of Quebec, has been commenced. An eight-turbine power house with necessary storage dams, the largest undertaking included in the construction plan of the Gatineau development, is to be erected. It will have a rating of 150,000 hp. Paugan Falls is situated 30 miles above the five-turbine power station now nearing completion at Chelsea, where 120,000 hp. will be developed early next year. Work on the power plant at Farmers' Rapids, just below Chelsea, is also forging ahead. Together the three plants will have an initial capacity of 400,000 hp.

Men of the Industry

E. S. Hight Receives Promotion

Eugene S. Hight, operating engineer of the North American Light & Power Company and associated companies, has been appointed chief engineer of that organization with headquarters at Chicago. Mr. Hight is a native of Green Valley, Ill., and received his technical training at the University of Illinois. He spent fourteen years with the Illinois Traction System, first as operating engineer, subsequently as electrical engineer and as chief operating engineer just prior to his affiliation with the North American Light & Power Company in 1924 in the capacity of general operating engineer. Mr. Hight is a member of the American Institute of Electrical Engineers.

E. S. HIGHT

Lester E. F. Wahrenburg has been appointed assistant design engineer of the Duquesne Light Company, Pittsburgh.

Royce E. Johnson, formerly electrical service inspector for the Railroad Commission of Wisconsin, has been appointed instructor in electrical engineering at the University of Wisconsin.

M. N. H. Polhemus has entered the operating department of the Central Hudson Gas & Electric Company. Mr. Polhemus was formerly identified with the General Electric Company at Philadelphia and Baltimore.

Philip G. Gossler, president and chairman of the board of the Columbia Gas & Electric Company, was elected a director of the Guaranty Trust Company of New York at a meeting of the board of the trust company on Oct. 6 to succeed Thomas E. Wilson, resigned.

B. G. Slining has been appointed superintendent of construction of the North American Light & Power Company, with authority to supervise and direct construction work in co-operation with the division managers. A graduate of the Michigan College of Mines, Mr. Slining has been identified with hydraulic and industrial developments in the West and Southwest for a number of years. In addition, he brings to his new position a broad background in designing and constructing modern steam-power plants.

Ray K. Linsley, office manager of the Bristol & Plainville Electric Company at Bristol, Conn., has been transferred to the general offices of the Connecticut Light & Power Company at Hartford, Conn. Mr. Linsley has been connected with the Bristol & Plainville Electric Company and its predecessor, the Bristol & Plainville Tramway Company, for the past 27 years.

Albert B. Alsos, engineer in the power machinery division of the Bethlehem Shipbuilding Corporation, has resigned to become an engineer in the power division of Stone & Webster, Inc., Boston. **George R. Fulton,** until recently chief engineer of the Galveston & Houston Electric Railway, has also been appointed an engineer in the power division of Stone & Webster.

Bernard A. Behrend, well-known consulting engineer of Boston, was married Oct. 8 to Margaret Plumer Chase at All Saints' Church, Peterborough, N. H. A native of Switzerland, Mr. Behrend removed to the United States in the nineties and has been intimately identified with the electrical industry since his arrival. As chief engineer of the Bullock Electric Manufacturing Company, Cincinnati; as chief engineer of the electrical department of the Allis-Chalmers Company; as consulting engineer of the Canadian branches of these companies, and as advisory engineer of the Westinghouse Electric & Manufacturing Company, Mr. Behrend became a figure of national prominence in the engineering profession. He is the inventor of numerous electrical devices and designed some of the largest electrical machinery manufactured by the Allis-Chalmers, Bullock and Westinghouse companies. Mr. Behrend is a fellow of the American Institute of Electrical Engineers and of the American Academy of Arts and Sciences and a member of the American Society of Mechanical Engineers, the American Society of Civil Engineers and the Engineers' Clubs of New York and of Boston.

F. L. Maytag, chairman of the board of directors of the Maytag Company, Newton, Iowa, was made the recipient of a magnificent medallion by the Home Appliance Merchants of America as a token of recognition of his outstanding position as a manufacturer and merchandiser of electrical home appliances. The presentation was made to Mr. Maytag by Governor Hammill at the second annual dealers' convention banquet held Sept. 28 at the Hotel Savery, Des Moines. The medallion, more than 8 in. in diameter and weighing more than 10 lb., is made from 24-carat gold and is valued at $50,000.

W. B. Flanders, formerly engineer in the large turbine division of the engineering department of the South Philadelphia works of the Westinghouse Electric & Manufacturing Company, has been appointed to the position of assistant manager of engineering. The reorganization included the following changes: **R. C. Allen,** formerly assistant to the chief engineer, has

been appointed manager of large-turbine engineering. **J. A. MacMurchy**, formerly engineer small-turbine division of the engineering department, has been appointed manager of small-turbine engineering. **D. W. R. Morgan**, formerly engineer, condenser division, has been appointed manager of condenser and internal-combustion engineering.

G. T. Perley, formerly district power engineer of the Central Hudson Gas & Electric Company at Poughkeepsie, N. Y., has been transferred to the general power sales department of the company.

J. M. Duncan has severed his connection with the Ontario Hydro-Electric Power Commission to affiliate himself with the Atmospheric Nitrogen Company, Syracuse, N. Y.

K. F. Dickinson has been appointed district manager of the Northern Indiana Power Company at Huntington to succeed Fred E. Schornstein, resigned. Mr. Dickinson has been connected with the general offices at Indianapolis.

J. H. Edwards of Quebec, Canada, has been appointed advertising manager of the Danbury & Bethel Gas & Electric Company, Danbury, Conn., a subsidiary of the Cities Service Company.

William H. Matlack of East St. Louis, Ill., has assumed the duties of sales manager for the Illinois Power & Light Corporation in that city. He succeeds Samuel C. Schmulbach, who was promoted to be district manager at Cairo, Ill. Several years ago Mr. Matlack was construction manager of the St. Clair County Gas & Electric Company, which was later absorbed by the Illinois Power & Light Corporation.

G. H. Froebel, formerly manager of the marine sales department of the Westinghouse Electric & Manufacturing Company, East Pittsburgh, has been made central-station sales manager with headquarters in that city. Mr. Froebel's association with the Westinghouse interests dates back to 1912 and was preceded by three years' service with the San Antonio (Tex.) Gas & Electric Company and the San Antonio Traction Company.

Leonard S. Horner has been appointed president of the Niles-Bement-Pond Company. He has resigned as vice-president of the Acme Wire Company of New Haven to accept the new position and will have headquarters in New York. Mr. Horner has been connected with the electrical manufacturing industry for many years and in the past few years has been particularly active in the development and sale of static condensers for power-factor correction.

G. V. E. Stevens has entered the employ of the Central Hudson Gas & Electric Company in the capacity of district power engineer at Poughkeepsie to succeed G. T. Stevens, who has been transferred to the general power sales department.

Ollie Needham, formerly connected with the steel-mill section of the general engineering department of the Westinghouse Electric & Manufacturing Company, was recently promoted to be engineer in charge of steel-mill engineering, according to an announcement of H. W. Cope, assistant director of engineering. During his association with the Westinghouse company Mr. Needham has been in very close touch with developments in the design and application of steel-mill electrical equipment and has assisted in the installation of several large important steel-mill electrifications at plants of the Bethlehem Steel Company, the United States Steel Corporation and many independent steel companies. Mr. Needham is a member of the Association of Iron and Steel Electrical Engineers and the American Institute of Electrical Engineers and has presented papers before both of these associations on different occasions. In addition to this Mr. Needham has written articles for technical papers, including the ELECTRICAL WORLD and the *Industrial Engineer*.

Fred Vandiver, who has been connected with the Hartwell office of the Georgia Railway & Power Company, has been appointed superintendent of the Franklin district to succeed T. W. Wilson, who has assumed new duties in Carrollton.

Gordon Kribs, whose resignation from the New Brunswick Power Commission was reported in the June 26 issue of the ELECTRICAL WORLD, has joined the staff of H. G. Acres & Company, consulting engineers, Niagara Falls, Ontario. Mr. Kribs was formerly identified with the Hydro-Electric Power Commission of Ontario.

George Dennis has been appointed merchandising manager of the Twin State Gas & Electric Company, Boston, succeeding Everett L. Olds, resigned. Mr. Dennis has been assistant to Mr. Olds for the past six months and was previously connected with the Federal Electric Company, Chicago.

Obituary

Adolphe A. Dion

Adolphe A. Dion, one of the most prominent electrical engineers of Canada and general manager of the Ottawa Electric Company, the Ottawa Light, Heat & Power Company and the Ottawa Gas Company, died Oct. 8 in the Water Street General Hospital in Ottawa, following a critical operation, Mr. Dion's experience in the electrical industry had included work in the fields of telegraphy, railways and electric light and power. Born and educated in the city of Quebec, Mr. Dion subsequently removed to Ottawa, where he entered the employ of the old Dominion Telegraph Company. After occupying various positions he was placed in charge of electrical work on the Intercolonial Railway, running from Montreal to Halifax. For the past 35 years

A. A. DION

he had been identified with electrical enterprises in Ottawa, in addition to engaging in consulting work. In spite of his responsibilities in connection with the Ottawa utility companies, Mr. Dion found time to participate actively in association work, having been president of the Canadian Electrical Association for four terms—in 1900 and 1901 and again in 1912 and 1913. He was a fellow of the American Institute of Electrical Engineers, a member of the British Institution of Electrical Engineers and a member of the Canadian Society of Civil Engineers. Mr. Dion was 67 years of age.

Everett S. Wood, at one time credit manager of the B. F. Sturtevant Company, Hyde Park, Mass., died in Dennis, Mass., Oct. 9. He was a graduate of the Worcester Polytechnic Institute.

George W. Holdrege, a member of the board of directors of the Nebraska Power Company, Omaha, died Sept. 14 in his seventy-ninth year. Mr. Holdrege became a director of the company when it was known as the Thomson-Houston Electric Light Company. He was a prominent figure in railroad and government circles in the state until his retirement in 1920.

George Schley Davis, president of the Wireless Specialty Apparatus Company, Boston, a director of the Radio Corporation of America, fellow of the American Institute of Radio Engineers and a vice-president of the United Fruit Company, died suddenly at Brookline, Mass., Oct. 10. Mr. Davis had been closely identified with the development of radio engineering and its commercial applications for many years and was an intimate friend of Marconi, Edison, Harbord and others of scientific note. He was regarded as one of the foremost authorities in the country on radio.

Francis E. Nipher, a noted scientist and professor emeritus of physics at Washington University, St. Louis, died in that city Oct. 6 in his seventy-eighth year. Professor Nipher was especially known for his extensive study of the nature of electrical discharge, advancing his hypothesis in support of Franklin's one-fluid theory. He contributed to scientific journals and to the proceedings of technical societies many articles and reports on physics, magnetic measurements, photography and other topics. After teaching at the University of Iowa, his alma mater, for four years, he joined the staff of Washington University as professor of physics. He had been professor emeritus there since 1914, when he gave up teaching but continued research work.

Recent Court Decisions

State Cannot Tax Income from Interstate Commerce. — The New York Supreme Court, in Sayre Electric Company vs. Gilchrist, held that the income of the electric company derived exclusively from interstate commerce was not taxable by the state, but that the income derived from electricity bought and sold within the state was taxable. (N. Y. S. 619.)*

Commission Cannot Compel Utility to Furnish Service in Violation of Rules on File.—The Supreme Court of Missouri has ruled, in State ex rel. St. Louis County Gas Company vs. Public Service Commission of Missouri, that a schedule of rates and charges filed with the commission is binding upon both the utility company filing it and the public it serves and may be modified or changed only by the filing of a new or supplementary schedule. The commission has no authority to compel a utility company to make extensions and furnish service in violation of rules relating to rates and charges which are on file with the commission with its approval and are applicable to the public as a whole. (286 S. W. 84.)

Contributory Negligence Bars Recovery of Damages for Electric Shock. —Reversing a judgment for the plaintiff, the United States Circuit Court of Appeals in Ohio held, in McNutt vs. Monongahela West Penn Public Service Company, that the company was not negligent in failing to insulate wires on its own property in the manner required by the General Code of Ohio on streets or public places, and that no liability existed for injuries to a contractor himself guilty of negligence. It appeared that McNutt, to whom damages for injury had been awarded, had built a working platform on the company's property to suit himself, though a subordinate employee of the electric company had warned him of the danger. From this platform McNutt swung a binding wire within a couple of inches of the high-tension wire with the idea of finding a means to get material up to the roof. A serious accident followed. The court held that even if the victim did not know that electricity will arc and jump, his action showed recklessness. (13 Fed. (2d) 846.)

Admissible Evidence in Suit for Damages Because of Death from Contact with Drop Cord. — The Supreme Court of Missouri has sustained a verdict for the plaintiff in Morrow vs. Missouri Gas & Electric Service Company, a suit for damages because of the death of a man from contact with a drop cord he had attached to an electric socket, it being claimed that current at excessive voltage had been carried into the victim's house over the company's system. The company disputed responsibility, maintaining that its wires were not overcharged and that this was proved by inspection on the day following the fatality. The case hinged largely on what was admissible evidence. The Supreme Court held admissible (1) testimony concerning electric shocks received in their homes by other customers of the company in the neighborhood and as to the sparking of wires in certain trees through which the wires serving the home of the victim passed, (2) evidence of any act or omission of defendant tending to show that high-voltage current entered the premises, (3) the production as an exhibit of a limb from a tree with two distinct burns on it, the tree being across the street from the home of the deceased and the contention being that these burns might have been caused at the time of the fatality, although the limb was not removed until four months later. Inasmuch as the deceased was unclothed at the time of the accident and standing on a damp floor, the contention was put forth that he might have been killed by the normal voltage of 110, the shock being received because of the defective condition of the cord, for which the company was not responsible. All these points, the court held, were for the jury. (286 S. W. 106.)

Governmental and Proprietary Functions of Municipalities. — The United States District Court for the South District of Texas has handed down a decision in Rowan vs. City of Galveston in which it holds tentatively that a city operating street lights, but not conducting a lighting plant for profit or selling light to its inhabitants, was engaged in a proprietary rather than a governmental business and was liable for damages arising from the operation of said plant. The court remarked: "That this ought to be the law I have not, and never have had, any doubt. The vacillation and confusion exhibited in the opinions of the courts of the different states and of the same state relative to this question of whether an activity is proprietary or governmental illustrate the difficulties into which courts fall when they try to rest a decision upon an insufficient principle. While there was a clear justification of the holding, as applied to the ordinary activities of police and fire departments, that these were governmental and not proprietary, and that the city ought not to be charged with the acts of those persons as its agents, there never was any reason for extending that doctrine to streets, as in some states, and, specifically, there never was any reason for extending the doctrine even to police, fire, schools and other such public activities when complicated and dangerous instrumentalities are used by the city in connection with these functions. . . . Realizing the justness of this principle and yet trammeled with the difficulty of distinguishing between proprietary and governmental activities as such, courts have been put to all sorts of expedients to find liability, in some cases basing or refusing liability upon the question of whether or not the city receives return for services or gives them gratis, in other cases upon whether or not the service would redound to the pecuniary benefit of the city, by exempting or protecting it from suits for damages, and in other cases upon whether or not the city was engaged in these activities with or without authority from the Legislature. . . . Since neither the Supreme Court of the United States nor the Supreme Court of Texas has passed upon the precise question at bar, I am not precluded by any definite decision, and it is between the contention of plaintiff that I should follow what the Supreme Court of Texas has foreshadowed and of the defendant that I should rather go as the Supreme Court of the United States has foreshadowed that I have found my difficulty. I have concluded that I am not bound by the decision of either of these courts." (13 Fed. (2d) 257.)

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Commission Rulings

Invasion of Territory by Second Utility Disapproved.—The New Hampshire Public Service Commission has denied a petition of the Salem Electric Light Company for authority to extend its lines and service into that part of Salem known as District No. 8, on the ground that this territory is already occupied by another electric utility operator, Fred D. Tootell. The petitioner claimed that residents of the district had sought this extension of service and that Tootell had demanded exorbitant amounts from prospective customers, both as to installation charges and rates, before he would extend his lines to give them service. These allegations were denied by Tootell. In its finding the commission pointed out that any complaints as to rates or charges may be heard in proper proceeding, and that the issue in hand was solely that of invasion. On the ground that duplication of capital in power supply is objectionable and wasteful, with the loss eventually falling upon the consumer, the petition was denied.

Allowance for Electricity Dissipated Because of Ground on Customer's Premises.—Complaint was made to the New Jersey Board of Public Utility Commissioners because the monthly bills of a consumer of the Public Service Electric & Gas Company had increased by three or four times the former average. Inspection indicated the presence of an intermittent ground in the wiring on the premises. The board therefore found that all electric energy registered on the meter had been consumed on the premises of the complainant although a part of it might have been dissipated through a ground without being of material benefit to the customer, and it was recommended that the complainant pay a sum equal to the charges which would have been incurred by a normal consumption of electrical energy for the period covered by the disputed bills and in addition the bare cost of manufacture and delivery of the energy dissipated through the ground. The complainant having already paid the disputed bills in full, it was further recommended that the company refund the difference between the disputed bills and a sum arrived at in the manner just stated.

Financial and Corporate

Utilities Share Reaction

But, as Usual, the Movement Has Not Been so Pronounced as in Case of Industrial Securities

THE recent drastic decline in the security markets was accompanied by a slight recession in many of the public utility issues, but losses were not great in any case. The general weakness has led to much speculation as to the cause. Such autumn declines are by no means exceptional, but there has almost invariably been a visible cause—probably a sudden tightening of the money rates or some disturbing rumor. In the present situation there has been neither. The cotton situation has been blamed by some. Undoubtedly it is a factor, but it seems improbable that the danger of a superabundance of any agricultural product would have been the sole cause.

Then there are those who say that the decline has been only natural, in view of the fact that average stock exchange levels were, until recently, almost at the high point reached in last winter's speculative orgy, and that there was nothing in the business and industrial situation to support those heights. Much depends on the extent to which holdings have already been distributed to the buying public. How much of this has taken place is not yet clear.

As normally, the utility markets have reacted less vigorously than the industrials. At least this appears to have become the normal situation. There was a marginal recession in many of the preferred issues, although no losses were greater than approximately half a point. This leaves the general averages slightly lower.

In the common issues there was a slightly more pronounced decline than in the case of preferred. The index number of twenty common stocks prepared by the ELECTRICAL WORLD sagged from 90 to 89 during the week. The index stood at 86 at the beginning of the second half year and rose slightly each week to a high of 90. The leaders in the decline were Public Service of New Jersey, American Gas & Electric and Brooklyn Edison, but of the twenty, eight issues remained unchanged, eight declined and four strengthened.

Trading in the bond market continues reasonably active, but there have been no outstanding changes in price.

New Jersey Power & Light to Recapitalize.—Stockholders of the New Jersey Power & Light Company will vote Nov. 4 on increasing the authorized capital stock from $1,000,000 common and $1,000,000 preferred stock (7 per cent), both of $100 par value, to 150,000 shares of common stock and 100,000 shares of $6 cumulative preferred stock of no par value. Stockholders will also vote on that date on approving the merger of the company with the Newton Gas Company and the Washington Gas Company. Preferred stockholders of the New Jersey Power & Light Company will have the choice of taking for each share of the present 7 per cent preferred stock one share of new $6 preferred stock, which is redeemable at 110 and dividends and $16 in cash, or in cash at 110 and dividends to date of payment, the price at which the company is permitted by the terms of its charter to call and redeem the outstanding preferred stock.

Kentucky Utilities Company to Call Bonds.—Holders of all outstanding first mortgage gold bonds, series B and series E, of the Kentucky Utilities Company have been called for payment. The series B bonds, dated Nov. 15, 1921, and maturing Nov. 15, 1941, will be redeemed and become due and payable Nov. 15 at par and accrued interest to that date plus a premium of 7½ per cent upon the principal. Series E bonds, dated July 1, 1924, and maturing July 1, 1949, will be redeemed and become due and payable Nov. 1 at par and accrued interest to that date plus a premium of 5 per cent upon the principal.

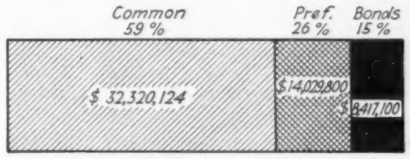
German Bonds to Be Offered in United States

A new issue of fifteen-year 7 per cent sinking-fund mortgage bonds of the Unterelbe Power & Light Company, totaling $2,500,000, will shortly be offered the American investing public by A. G. Becker & Company. The Unterelbe Power & Light Company, of which the entire capital stock, consisting of 20,000,000 reichsmarks par value, is owned by the city of Altona, Germany, supplies electric light and power without competition in Altona and certain nearby districts.

National Power & Light Covers Big Area

This Organization Is Holding Company for a Group of Utility Companies Serving Over Two Hundred Communities in Five Commonwealths

ALTHOUGH not a new company, the National Power & Light was incorporated in its present form last December, having purchased the common stock of a growing group of utilities in Tennessee, Alabama, Arkansas and Texas. The companies controlled comprise Birmingham Electric, Houston Light & Power, Jackson Railway & Light, Knoxville Power & Light, Memphis Power & Light, Memphis Street Railway and the Carolina Power & Light Company. The group serves a total population of more than 1,163,000.



CAPITAL STRUCTURE OF NATIONAL POWER & LIGHT COMPANY AS OF FEB. 28, 1926

Gross earnings of the National Power & Light subsidiaries for the year ended June 30 were $31,640,117 against $28,002,124 the previous year, and net earnings were $12,291,060 against $10,716,320. Gross earnings of the holding company and undistributed income of the subsidiaries applicable to National Power & Light dividends after renewal and replacement appropriations of $2,658,274 amounted to $5,149,057 for the same period. Operating expenses were $74,864 and interest requirements $653,202, leaving a balance applicable to dividends of $4,420,991. Preferred dividends required only $556,252 so that earnings were $31.51 a share. The balance applicable to common was $3,864,739. Common dividends took $875,172, leaving undistributed income of $2,989,577. The total assets of the company as of June 30 were $58,786,230. Combined earnings for the twelve months ended May 31 this year applicable to interest payments were eight and three-quarters times annual interest requirements.

National Power & Light's capital structure includes $9,500,000 6 per cent debentures sold in August of this year, 140,298 preferred shares paying $7 and 2,545,815 common shares. A recent quotation on the preferred is 101 and on the common 21. This gives a value of $14,170,098 to preferred stock outstanding and $53,462,115 to common. Arrangement was made for redemption of the $8,417,100 issue of 50-year, 7 per cent income bonds last September, and the company thus gains the advantage of cheaper money.

The accompanying chart shows the capital structure of National Power & Light and the relative percentage of each class of securities in relation to the total capitalization. The common stock of National Power & Light has remained relatively stable around $22 during the past three months.

Stock Issuance Authorized in Massachusetts.—The Massachusetts Department of Public Utilities has approved the issuance by the Lowell Electric Light Corporation at $47.50 a share of 12,881 shares of additional stock, par $25. The proceeds are to be applied to

the retirement of floating indebtedness incurred for additions to the company's property. The corporation asked for authority to issue 17,175 shares, but the commission decided that the sale of the smaller number of shares would raise sufficient funds to take care of outstanding notes.

New Capital Issues

First mortgage 5 per cent gold bonds were issued during the week ended Oct. 14 by the Kentucky Utilities Company in connection with the financing of new construction work. The offering involved a total of $6,250,000 in the form of bonds priced at 97 and interest, yielding about 5.20 per cent. These bonds, dated Feb. 1, 1926, and maturing Feb. 1, 1961, are secured by a direct first mortgage upon all the fixed properties, rights and franchises now owned by the company, and no additional bonds may be issued on account of the acquisition of additional property unless the mortgage shall be a first lien thereon. The new construction work will consist of a new hydro-electric generating station on the Kentucky River to be built by the Kentucky Hydro-Electric Company, a subsidiary of the Kentucky Utilities Company. The new station will have an estimated output of 10,000,000 kw.-hr. per year.

The Tide Water Power Company, which last week contributed $1,500,000 to the total of new offerings in the form of 7 per cent preferred stock, issued this week general lien twenty-year 6 per cent gold bonds amounting to $2,500,000. These bonds, dated Aug. 2, 1926 and maturing Aug. 1, 1946, were priced at 98½ and interest, to yield over 6 per cent. They are a direct obligation of the company and in the opinion of counsel will have a general lien on all properties, plants, buildings, structures, erections and constructions of the company now owned or hereafter acquired and, further, on all securities now and hereafter deposited as security for the first lien and refunding mortgage bonds. These bonds will be subject in that general lien only to the first lien and refunding mortgage and underlying mortgage now outstanding. Proceeds of the sale of these bonds, together with the proceeds from the issue of $3,750,000 first lien and refunding mortgage 5 per cent bonds and $1,500,000 preferred stock and 20,313 shares of common stock without par value, will be used for the acquisition of all of the property of the Florida Power Corporation and the entire capital stock of the West Florida Power Company; to provide funds for the redemption of the 7 per cent debenture bonds amounting to $1,461,900, and in part for expenditures already made and additional expenditures presently to be made in connection with the construction program now under way in Florida.

Central Maine Company Calls Bonds.—All of the outstanding first and general mortgage 7 per cent gold bonds, series A, of the Central Maine Power Company, due 1941 and totaling $3,000,000, have been called for redemption Dec. 1 at 107 and interest.

Connecticut Utility to Redeem Bonds.—Certain first and refunding mortgage 7 per cent sinking-fund gold bonds, series A, of the Connecticut Light & Power Company, dated May 1, 1921, and aggregating $84,000, have been called for redemption Nov. 1 at 110 and interest.

Southern California Edison Stockholders' Rights.—Holders of the common, preferred and original preferred stock of the Southern California Edi-

Stock Quotations of Electric Light and Power and Manufacturing Companies

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

Companies	Bid Price Monday Oct. 11	Low 1926	High 1926
ABITIBI PWR. & PAPER, com. —no par	*k* 94¼	70¼	98
Adirondack Pwr. & Lt.—7% pf.	105	....	....
Adirondack Pwr. & Lt.—8% pf.	113	....	....
Ala. Pwr., pf.	107	....	....
Allis-Chalmers Mfg. pf.	108½	105	110½
Allis-Chalmers Mfg., com.	86½	78½	94½
Aluminum Co. of Amer., com.	70¼	54½	76
Aluminum Co. of Amer. pf.	101	....	....
Amer. & Foreign Pwr., pf. 25% pd.	*m*110	....	....
Amer. & Foreign Pwr., 7% pf.—no par	83	79	98
Amer. & Foreign Pwr., com.—no par	15½	14½	42¾
Amer. Bosch Magneto, com—no par	18	16	34¼
Amer. Brown, Boveri, Elec.	39½	30½	50
Amer. Brown, Boveri, Elec., pf.	*k* 95	86½	97½
Amer. Elec. pwr., pf.	*m*111	102	111
Amer. Gas & Elec., 6% pf.—no par.	95½	90½	95¾
Amer. Gas & Elec., com.—no par.	102¾	64	110½
Amer. Lt. & Trac., 6% pf.	109	105	115½
Amer. Lt. & Trac., com.	206	193	263
Amer. Pwr. & Lt., 6% pf.	98½	92	99
Amer. Pwr. & Lt., com.—no par.	*m* 66¼	50¼	72
Amer. Pub. Serv., 7% pf.	*a* 97½	92	99
Amer. Pub. Serv., com.	50	45	80
Amer. Pub. Utilities, 6% pf.	84	....	....
Amer. Pub. Utilities, 7% pf.	92½	....	....
Amer. Pub. Utilities, com.	70	....	....
Amer. States Sec., A	2½	....	....
Amer. States Sec. B	3	....	....
Amer. Superpwr., pf.—25	26	23	26¼
Amer. Superpower, pf.	*l* 95	....	....
Amer. Superpwr., Class A—no par.	28½	19½	37½
Amer. Superpwr., Class B—no par.	29½	21½	39
Amer. Wtr. Wks. & Elec., 7% pf.	*k*103	101½	108½
Amer. Wtr. Wks. & Elec., com.—20.	53	43½	74
Anaconda Copper	47½	41½	51½
Appalachian Pwr., 7% pf.	95	90	101
Appalachian Pwr., 1st pf., 7%	95	99	102
Appalachian Pwr., com.	78	78	83
Arizona Pwr., 7% pf.	59	....	....
Arkansas Cent. Pwr., pf., $7—no par	*k*104	99	107
Arkansas Lt. & Pwr., 7% pf.	102½	....	....
Arkansas Lt. & Pwr., com.	100	110	115
Asheville Pwr. & Lt., 7% pf.	*l*107	101½	107½
Assoc. G. & E., pf.—$3.50—50	50	....	....
Assoc. Gas & Elec., pf.—$6—no par	83	....	....
Assoc. Gas & Elec., Class A—no par	34½	25½	38¾
BABCOCK & WILCOX, com.	115½	114	149
Binghamton Lt., Ht. & Pwr., pf.	105	105	110
Birmingham Elec. pf.—$7—no par.	105	....	....
Blackstone Valley Gas & Elec., pf.	103	103	106
Blackstone Valley G.&E., com.—50	*k*100	....	....
Blaw-Knox, com.	*i* 74½	45	80
Brazilian Trac., Lt. & Pwr., com.	*f*110½	....	....
Broad River Pwr., pf.	95	....	....
Brooklyn Edison, com.	150	133	163
Buffalo, Niagara&East. Pwr., pf.—25.	*l* 24½	....	....
Buffalo, Niagara & Eastern Pwr., com.—no par.	*l* 29½	....	....
CALIFORNIA ELEC. GENERATING, pf.	92½	89	95
California Ry. & Pwr., pf.	120	88	130
Carolina Pwr. & Lt., pf.—$7—no par	107	....	....
Cent. & S. W. Ut. 7% pf.—no par	*a* 92	89½	96½
Cent. & S. W. Ut., pr. In. pf.—no par	*a* 99	93	100
Central Ariz. Lt. & Pwr., pf.	104	....	....
Central Ark. Ry. & Lt., 7% pf.	100	....	....
Central Ill. Pub. Serv., 6% pf.	*a* 89	87	91
Central Ind. Pwr., 7% pf.	88	85	93½
Central Pwr. & Lt., pf.	99½	....	....
Central States Elec., 7% pf.	91	....	....
Central States Elec., com.	*m*200	200	230
Century Elec., com.	*m*115	110	116
Chicago Fuse Mfg., com., no par.	*a* 31	30	35
Cincinnati Gas & Elec., com.	*g* 90	88	95
Cities Service, 6% pf.	*l* 89½	86½	89½
Cities Service, pf.B—10.	*i* 7½	7½	7½
Cities Service, pf. BB—100.	*l* 77½	74	79
Cities Service, com.—20.	*l* 45½	37½	45½
Cities Service, Bks. Shrs.—10.	*l* 22½	19½	22½
Clarion River Pwr., pf.	95	93	95
Cleveland Elec. Illg., 6% pf.	107	....	....
Cleveland Elec. Illg., com.	208	....	....
Colorado Pwr., 7% pf.	*k* 95	96	97
Columbia Gas & Elec., 7% pf.	*k*114	111½	115½
Columbia Gas & E., com.—no par.	80¼	63½	90
Columbia Ry., Gas & Elec., 6% pf.	90	65	96
Columbus Elec. & Pwr., 2d pf.	104	....	....
Columbus Elec. & Pwr., com.	275	....	....
Columbus Ry., Pwr. & Lt., 1st pf.	*k* 98½	98	99½
Columbus Ry., Pwr. & Lt., pf. B.	*k* 94	92	97
Col. Ry., Pwr. & Lt., com.—no par.	69	....	....
Commonwealth Edison, com.	*a*138½	135½	145
Commonwealth Pwr., 6% pf.	90	82	91
Commonwealth Pwr., com—no par.	39	28½	43½
Conn. Lt. & Pwr., 8% pf.	*k*117	117	121
Conn. Lt. & Pwr., 7% pf.	108	....	....
Cons. Gas of N. Y., pf.—50.	58	....	....
Cons. Gas of N.Y., com.—no par.	103½	87	115½
Cons. Gas Elec. Lt. & Pwr. of Balti., 6% pf.	*e*105½	102	107½
Cons. Gas, Elec. Lt. & Pwr. of Balti. 6½% pf.	*e*110½	108½	111½
Cons. Gas, Elec. Lt. & Pwr. of Balti. 7% pf.	*e*112½	109	113½
Cons. Gas, Elec. Lt. & Pwr. of Balti. 8% pf.	*e*126½	124	128½
Cons. Gas, Elec. Lt. & Pwr. of Balti. com.—no par.	*e* 52½	45	57½
Cons. Pwr. & Lt., 7% pf.	105	....	....
Consumers Pwr., 6% pf.	98	....	....
Consumers Pwr., 6.6% pf.	104	....	....
Continental Gas & Elec., 7% pfc. pf.	101	....	....
Continental Gas & Elec., 7% pr. pf.	97½	....	....
Continental G.&E., com.—no par.	*k*150	85	150
Crocker Wheeler, com.	21	....	....
Crocker Wheeler, pf.	57	....	....
DALLAS PWR. & LT., 7% pf.	107	....	....
Dayton Pwr. & Lt., 6% pf.	99½	....	....
Detroit Edison, com.	137½	123½	141½
Dubilier Condenser & Rado, com.—no par.	4¼	4¼	11
Dubuque Elec., 6% pf.	94	93	98½
Duquesne Lt., 7% pf.	116	111½	116½
EAST, N. Y. UTIL. pf.	102	80	104
Eastern New York Util., com.	65	70	75
Eastern States Power.	14	....	....
Eastern States Power, pf.	89	....	....
Eastern Tex. Elec., 7% pf.	105	....	....
East. Tex. Elec., com.—no par.	75	70	80
Edison Elec. Illum. of Boston, com.	*d*228	207	250
E. Paso Elec., com.—no par.	70	70	94
E. Paso Elec. pf.	103	....	....
Elec. Bond & Share, 6% pf.	*l*106½	103½	109½
E. Bd. & Share Sec., com.—no par.	*l* 66½	56½	86
El. Household Util.	*a* 13½	13	25
Elec. Investors, 6% pf.—no par.	92½	....	....
Elec. Investors, com.—no par.	37½	30½	74½
Elec. Invests., 10% pd. receipts.	25	12	56
Elec. Pwr. & Lt., ctfs. pf.	*k* 94	89½	98½
Elec. Pwr. & Lt., ctfs., 40% pd.	*k*102½	99½	115
Efec. Pwr. & Lt., ctfs. full pd.	*k*102½	102½	110½
Elec. Pwr. & Lt., ctfs., com—no par.	16½	15½	34½
Elec. Refrig.	55½	52½	78½
Elec. Ry. Securities, com.—no par.	*k* 5½	4½	10
Elec. Storage Battery, com.—no par.	85½	71½	94½
Elmira Wtr., Lt. & R. R., 7% pf.	99	97½	99½
Emerson Elec., pf.	*b*101	100	104½
Empire Dist. Elec., 6% pf.	*l* 88	82	88
Empire Power, A.	27	21	32
Engr. Pub. Serv., pf.—no par.	*m* 94	94	96½
Engr. Pub. Serv., com.—no par.	20	20	24½
Eureka Vac. Cleaner, com.—no par.	50½	43	56
FAIRBANKS MORSE, pf.	*k*109	108	115
Fairbanks Morse, com.—no par.	45½	43½	59½
Federal Lt. & Trac., com.	31½	28	39½
Federal Light & Traction, pf.	*k* 88	86	91½
Federal Utilities, pf.	*m* 70	....	....
Federal Utilities, com.	*m* 17	....	....
Ft. Worth Pwr. & Lt., 7% pf.	*l*107½	105	108½
GALVESTON-HOUSTON ELEC., 6% pf.	61½	....	....
Galveston-Hstn. El., com.	25	....	....
Gen. Elec., com.	82½	79	95½
Gen. Elec., special—10.	11½	11	11½
Gen. G.&E., (Del.) com. A no par.	42	34	59
Gen. G.&E., (Del.) com. B no par.	38½	38½	48½
Gen. G.&E., (Del.) A pf. $8 no par.	*k*110	105½	113
Gen. G.&E., (Del.) A pf. $7 no par.	*k* 98	95	99½
Gen. G.&E., (Del.) pf. B.	*k* 93½	92½	96
General Public Service, pf.	103	100	106
General Public Service, com.	*k* 12	12	16½
Ga. Lt., Pwr., & Rys., 6% pf.	95	82	98
Ga. Lt., Pwr. & Rys., com.	*m* 70	65	80
Ga. Ry. & Power, 8% pf.	*k*114	112	114
Ga. Ry. & Power, 7% pf.	106	....	....
Ga. Ry. & Pwr., 4% pf.	*k*120	105	145
Ga. Ry. & Pwr., com.	120	....	....
Gt. Western Pwr., 7% pf.	*h*102	....	....
IDAHO PWR., 7% pf.	104½	....	....
Ill. No. Utilities, 6% pf.	*a* 92½	90	92½
Ill. Pwr. & Lt., 7% pf.	98½	....	....
Ingersoll Rand	95	80½	105
Int. Combus. Engr., com.—no par	42½	33½	64½
Int. Utilities, class A—no par.	*k* 30	25	39
Int. Utilities, class B—no par.	5	3½	9½
Interstate Pwr., pf., no par.	92	....	....
Interstate Pub. Serv., 7% pf.	96	96½	99
Iowa Ry. & Lt., 7% pf.	95	98	100
JERSEY CENTRAL PWR. & LT., 7% pf.	96	....	....
Jersey Central Pwr. & Lt., pfc., pf.	100	95½	112
Jersey Central Pwr. & Lt., com.—no par.	45	45	50
Johns-Manville, com.—no par.	143½	130	165

Stock Exchange: *a*Chicago; *b*St. Louis; *c*Philadelphia; *d*Boston; *e*Baltimore; *f*Montreal; *g*Cincinnati; *h*San Francisco; *i*Pittsburgh; *j*Washington. *k*Bid, low, high. Saturday, Oct. 9. *l*Bid, low, high, Wednesday, Oct. 13. *m*Latest quotations available.

Stock Quotations of Electric Light and Power and Manufacturing Companies (Continued)

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

Companies	Bid Price Monday Oct. 11	Low 1926	High 1926
KANSAS CITY PWR. & LT., pf.	*k*112	107¼	112¼
Kansas Gas & Elec., 7% pf. ex. div.	*l*102½	99	103
Kentucky Hydro-Elec., pf.	*a* 93½	91½	95½
Kentucky Sec., 6% pf.	80	..	....
Kentucky Sec., com.	100	..	....
Kentucky Utilities, 6% pf.	93	90	95
Keystone Pwr. & Lt. 7% pf.	96	95	97
LACLEDE GAS LT., com.	*k*158	146	175½
Lehigh Pwr. Sec., com.—no par	15	10	22
Long Island Ltg., 7% pf.	108	....	....
Long Island Ltg., com.—no par	135	120	150
Los Angeles Gas & Elec., 6% pf.	99	....	....
Louisville Gas & Elec., Class. A	24	22½	26½
MANHATTAN ELEC. SUPPLY.	52½	49½	87½
Manila Elec., com.—no par	43½	27½	45½
Maytag Mfg., com.	22½	19	24½
Memphis Pwr. & Lt., pf., $7, no par	108	103	109
Metro. Edison, pf.—$6—no par	104	....	....
Metropolitan Edison, pf., $7, no par.	105	....	....
Metropolitan Edison, com., no par.	50	45	50
Middle West Utilities, 7% pf.	*a*105½	97½	111½
Middle West Utilities, 7% pr. lien pf.	*a*115½	106½	123½
Middle West Utilities, com.—no par.	*a*113½	108	134½
Midland Utilities, pr. ln. pf.	*a*100	98	104
Midland Utilities pf. A	*a* 97½	96	99½
Milwaukee Elec. Ry. & Lt., 7% pf.	*a* 98	100	102
Milwaukee Elec. Ry. & Lt., 6% pf.	91	87	88½
Minn. Pwr. & Lt., 7% pf.	*l*104½	100	104
Miss. Pwr. & Lt., pf.	*k*104	102	105½
Miss. River Pwr., 6% pf.	95	....	....
Miss. River Pwr., com.	*m* 60	....	....
Mohawk Hudson Pwr., 1st pf.—$7—no par	103½	99	105
Mohawk Hudson Pwr., 2nd pf.—$7—no par	101	....	....
Mohawk Hudson Pwr., com.—no par	24	20½	28½
Montana Pwr., pf.	*m*117½	112½	119½
Montana Pwr., com.	77½	69½	83½
Montreal Pwr., com.	*f* 74½	....	....
Mountain States Pwr. pf.	97	....	....
Mountain States Pwr., com.	18	....	....
NASSAU & SUFFLOK, LTG., pf.	99	....	....
National Carbon, pf.	*m*125½	125	128
National Electric Pwr-A.	*a* 23	19½	26½
National Elec. Pwr., pf.	*a* 93½	92	96½
Nat. Lt., Ht. & Pwr., com.	24	22	25
National Lt., Ht. & Pwr., 5% pf.	72	71	73
National Pwr. & Lt., pf., $7—no par.	101½	96	102½
National Pwr. & Lt., com.—no par.	19½	16½	38½
National Pub. Serv., 7% pf.	*k* 89	90	95
National Pub. Serv., pte. pf.	108	....	....
National Pub. Serv., A com.—no par.	18½	15½	24
National Pub. Serv., B com.—no par.	14½	10	17½
Nebraska Pwr., 7% pf.	*l*107½	103	107½
Nevada-Calif., Elec., com.	*k* 20½	18½	44½
New Brunswick Pwr. pf.	55	30	55
New England Pub. Serv., pr. ln. pf..	99	98	99½
New England Pub. Serv., pf.	93	95½	97
N. J. Pwr. & Lt., 7% pf.	108	104	110
New Orleans Pub. Serv., 7% pf.	103½	....	....
N. Y. & Queens Elec. Lt. & Pwr., 5% pf.	89?	....	....
N. Y. Central Elec., 7% pf.	98½	98	100
Newport News & Hampton Ry., Gas & Elec., com.	109	98	112
Newport News & Hampton Ry., Gas & Elec., pf.	109	98	114
Niagara Falls Pwr., 7% pf.—25.	*k* 28½	27½	28½
Niagara, Lock. & Ont. Pwr., 7% pf..	109	110	111½
No. Amer., 6% pf.—50.	51½	49	52½
No. Amer., com.—10.	49	42	67
No. Amer. Edison pf.—no par.	*k* 96½	91½	96½
No. Amer. Lt. & Pwr., pf.	101	88	104
No. American Utilities, pf., full pd..	*m* 94½	89	96
No. American Utilities, pf., 25% pd.	*m* 19	18	27
N.C. Pub. Serv., pf.—$7—no par.	92½	....	....
Northeastern Pwr., com.	16½	15½	36½
No. Indiana Gas & Elec., pf. A.	101	98½	103½
No. Indiana Public Service—pf.	101	99	103½
No. N. Y. Utilities, 7% pf.	104½	....	....
No. Ohio Pwr., com.—no par.	12½	11	26½
No. Ohio Trac. & Lt., 6% pf.	78	78	81
No. Ohio Trac. & Lt., 7% pf.	92	88	96
No. Ont. Lt. & Pwr., pf.	*k* 78	78	84
No. Ont. Lt. & Pwr., com.	73	45	75
No. States Pwr., 7% pf.	101½	99½	103½
No. States Pwr. com.	104	97	136½
No. Texas Elec., 6% pf.	61½	....	....
No Texas Elec., com.	25	....	....
OHIO BRASS, com. B—no par.	72	70	79
Ohio Brass, pf.	100	98	101
Ohio Gas & Elec., 7% pf.	94	92	95
Ohio Pwr., 6% pf.	95	93	96
Ohio Pub. Serv., 6% pf.	*l* 94½	90	96½
Ohio Pub. Serv., 7% pf.	*l* 99	96	100
Ohio River Edison, pf.	101	....	....
Oklahoma Gas & Elec., pf.	96	....	....
PACIFIC GAS & ELEC., 6% pf.	100	....	....
Pacific Gas & Elec. com.	128½	118	133½
Pacific Pwr. & Lt., 7% pf.	*l*102½	98	102½
Parr Shoals Pwr., 6% pf.	92	....	....
Penn Central Lt & Pwr., pf.—no par	*c* 73	70½	91
Penn-Ohio Edison, 7% pf.	95½	....	....
Penn-Ohio Elec., 7% pf.	96	93	96
Penn-Ohio Pwr. & Lt., 7% pf.	98	....	....
Penn-Ohio Pwr. & Lt., 8% pf.	109	....	....
Penn Pwr. & Lt.—$7—no par.	*l*107½	103	108½
Penn Pub. Serv., 7% pf.	103	96	103
Penn Pub. Serv., 6% pf.	87	85	90
Penn Wtr. & Pwr., com.	*e*170	141	171
Phila. Co., 6% pf.—50.	45	45?	51½
Phila. Co., com.—50.	*k* 72	59½	76½
Phila. Elec., com.—25.	*c* 48½	41½	67½
Pittsburgh Utilities, pf.—10.	*m* 19½	14½	20½
Portland Elec. Pwr., 7% pf.	99	....	....
Portland Elec. Pwr., 6% pf.	*k* 82	71	87
Portland Elec. Pwr., 6% 2nd pf.	*k* 70	71	75
Portland Elec. Pwr., com.	27	....	....
Potomac Elec. Pwr., pf.	*l*107½	....	....
Pwr. Corp. of N.Y., com—no par.	*m* 79	77½	90½
Pwr. Sec., pf.—no par.	*k* 24	10	29
Pwr. Sec., com.—no par.	*k* 6	4	13
Pub. Serv. of N. J., 7% pf.	108½	103½	109½
Pub. Serv. of N. J., 8% pf.	*k*121½	115	123½
Pub. Serv. of N. J., com.—no par.	92½	72	97½
Pub. Serv. of No. Ill., 6% pf.	*a*101½	100½	106
Public Serv. of No. Ill., 7% pf.	*a*114½	112	116½
Pub. Serv. of No. Ill., com.—no par	*a*131½	128½	140
Pub. Serv. of No. Ill., com.	*a*132	129½	143
Pub. Serv. of Okla., 7% pf.	98	92	97
Pub. Serv. Elec. & Gas, 6% pf.	*k*102½	97	104½
Public Service Elec. Pwr., pf.	*k*112½	106	114
Puget Sound Pwr. & Lt., 7% pf.	103	....	....
Puget Sound Pwr. & Lt., 6% pf.	83	....	....
Puget Sound Pwr., & Lt., com.	27	....	....
RADIO CORP. OF AM., pf.—50.	49	44½	49½
Radio Corp. of Amer., com.—no par.	52½	32	57½
Republic Ry. & Lt., pf.	108	....	....
Republic Ry. & Lt., com.	*k* 85	75	97
Rochester Gas & Elec., 5% pf.	95	80	98
Rochester Gas & Elec., 6% pf.	102½	100	103
Rochester Gas & Elec., 7% pf.	104	105	107
SAN JOAQUIN LT. & PWR., 7% pf.	97	97½	98½
Safety Cable, com.	50½	42½	55
St. Joseph Ry., Lt., Ht. & Pwr., pf.	67	60	70
Servel Corp.	15½	14½	22½
Sierra Pacific Elec., com.	24½	....	....
Sioux City Gas & Elec., 7% pf.	*k* 98½	96	101
S. E. Pwr. & Lt., pf.—$7—no par.	*l* 99½	....	....
Southeastern Pwr. & Lt., pte. pf.	*l* 67½	....	....
S E. Pwr. & Lt., com.—no par.	29½	20	46½
So. Calif. Edison, 8% pf.—25.	*k* 33¾	32½	33½
So. Calif. Edison, 7% pf.—25.	27½	....	....
So. Calif. Edison, 6% pf.—25.	24½	....	....
So. Calif. Edison, com.	30½	30½	33
Southern Cities Utilities, 7% pf.	85	....	....
Southern Cities Utilities, com.	33	....	....
Southwestern Lt. & Pwr., A.	60	....	....
Southwestern Lt. & Pwr., B.	60	....	....
Southwestern Lt. & Pwr., $6 pf.	80	....	....
Southwestern Pwr. & Lt., 7% pf.	*k*104	100	105
Springfield (Mo.) Ry & Lt., 7% pf.	97	95	100
Standard Gas & Elec., 8% pf.	55½	53½	57½
Standard Gas & Elec., 7% pf.	103	....	....
Standard Gas & Elec., com.—no par.	53½	51	69
Standard Pwr. & Lt., 7% pf.	95	....	....
Staten Island Edison, pf.—$6—no par	96	....	....
Superheater, com.—no par.	157	....	....
Syracuse Lighting, 7% pf.	102	105	107
Syracuse Lighting, 8% pf.	115	....	....
Syracuse Lighting, com	340	260	355
TAMPA ELEC., com.	49	....	....
Tenn. Elec. Pwr., 6% pf.	89	....	....
Tenn. Elec. Pwr., 7% pf.	102	....	....
Terre Haute, Ind. & East Trac., pf.	20	20	37
Terre Haute, Ind. & East. Trac., com	1	1	7
Tex. Pwr. & Lt., 7% pf.	*l*107½	102	107½
Tide Water Pwr., 8% pf.	104½	....	....
Timken Roller Bearing, com—no par	64	44½	64½
Toledo Edison, 8% pf.	*l*113	111	113
Toledo Edison, 7% pf.	*l*102½	101	103
Toledo Edison, com.	100	....	....
Tri-City Ry. & Lt., 6% pf.	88	87½	89
UNITED GAS & ELEC., 6% pf.	98	....	....
United Gas & Elec., com.—no par.	*m* 57	56	66
United Gas & Elec. (N.J.), 5% pf.	71	....	....
United Gas Impr.—50.	*c*108½	84½	144½
United Lt. & Pwr. pf.—$4—no par.	50	44	51
United L. & P. pf.—$6.50—no par.	88	81	91
United Lt. & Pwr., com., A—no par	*a* 11½	11½	26
United Lt. & Pwr., com., B—no par	*a* 17½	15	31
Utah Pwr. & Lt., 7% pf.	*l*102½	99	103½
Utica Gas & Elec., 7% pf.	*k* 04½	103	106
Utica Gas & Elec., com.	200	....	....
Utilities Pwr., & Lt., 7% pf.	92	....	....
Utilities Pwr. & Lt., com A.	29½	28½	37
Utilities Pwr. & Lt., com. B—no par	*k* 14	13½	18
VERMONT HYDRO - ELEC., 7% pf.	94	94	96
Virginia Elec. & Pwr., 7% pf.	104	101	105
Virginia Pwr., 7% pf.	108	102	104
Virginian Pwr., com.	70	65	75
WAGNER ELEC., pf.	*b* 74	61½	85
Wagner Elec., com.—no par.	*b* 23	13½	34½
Washington Ry. & Elec., com.	*j*188	....	....
Washington Ry. & Elec., pf.	*j* 90	....	....
Washington Wtr. Pwr., com.	132	130	136
West Mo. Pwr., 7% pf.	92	....	....
West Penn., 7% pf.	*m*115	108	115
West Penn, com.	*m*125	118	130
West Penn Elec., pf.	*k*101	95½	101
West Penn Elec., Class A.	*k* 90	88½	98
West Penn Pwr., pf.	*k*113½	108	115
West Va. Lt., Ht. & Pwr., 7% pf.	94½	95	98
West Va. Uti ities, 7% pf.—50.	46	43	48
Western Pwr., 7% pf.	98	91½	99
Western States Gas & Elec., 7% pf.	92	....	....
Western States Gas & Elec., com.	16	....	....
Westinghouse El. & Mfg., com—50.	67½	65	79½
Weston Elec. Instrument, Class A..	32	27½	32½
Weston Elec. Instrument, com.	16½	13½	19½
Wheeling Elec., pf.	93	91	97
Wis. Pwr., Lt. & Ht., 7% pf	*k* 90	85	90
Worthington Pump, pf. A.	*k* 63	63	80
Worthington Pump, pf. B.	*k* 51	52	65
Worthington Pump, com.	*k* 28	20½	44½
YADKIN RIVER PWR., 7% pf.	*l*107	102	107½
Yale & Towne, com.—25.	*k* 68	60½	72

Stock Exchange: *a*Chicago; *b*St. Louis; *c*Philadelphia; *d*Boston; *e*Baltimore; *f*Montreal; *g*Cincinnati; *h*San Francisco; *i*Pittsburgh; *j*Washington. *k*Bid, low, high, Saturday, Oct. 9. *l*Bid, low, high, Wednesday, Oct. 13. *m*Latest quotations available.

son Company of record Oct. 20 have been given the right to subscribe on or before Nov. 30 for new series B 6 per cent preferred stock (par $25) at $24.25 a share at the rate of one share for every twelve shares of stock owned. The California Railroad Commission recently authorized the issuance of 400,000 shares of series B 6 per cent preferred stock.

Associated Acquires Substantial Block of Staten Island Common Stock.—The minority common stock of the Staten Island Edison Corporation, amounting to approximately one-third of the total outstanding, has been acquired by the Associated Gas & Electric System, only a few scattering shares of such stock now remaining in the hands of the general public. The acquisition of this substantial block of common stock of the State Island Edison Corporation will add materially to the earnings of the Associated Gas & Electric System.

Cutler-Hammer Company Increases Capital.—The Cutler-Hammer Manufacturing Company has filed an amendment to its articles of incorporation under which it will increase its capital stock from $4,000,000 to $6,000,000, which change met with the unanimous consent of the stockholders. The amended articles provide for $4,000,000 in preferred stock and $2,000,000 in common stock.

International Paper to Increase Stock and Create New Issue.—Stockholders of the International Paper Company will meet Oct. 28 for the purpose of voting upon an increase in the number of the authorized shares of the cumulative 7 per cent preferred stock by 250,000 shares and an increase in the number of authorized shares of common stock by 250,000. They will also consider a proposal authorizing the directors to issue convertible notes or debentures to the amount of $25,000,000.

Change in Set-up of Savannah Company Approved.—The changes in capitalization of the Savannah Electric & Power Company, outlined in the Sept. 25 issue of the ELECTRICAL WORLD, were approved at a meeting of the stockholders held Oct. 7. The plan included an increase in the number of shares of both common and preferred stock and a change in the par value of the common from $100 to no par.

Offer for Montpelier & Barre Stock.—Charles H. Tenney, D. Willard Leavitt and Matthew Lahti, as voting trustees, in an announcement to the stockholders of the Montpelier & Barre Light & Power Company who have deposited

their holdings with the voting trust, say in substance: "The trustees on Sept. 28, 1926, signed an agreement whereby they agreed to sell and the purchasers to buy, subject to the usual provisions allowing the purchaser to examine and verify the company's status and titles, all of the stock of the company deposited with the trustees. The time allowed for such examination will expire on Oct. 15, 1926, at which time it is expected that the purchaser will become bound to complete the purchase of the stock. The time provided for delivery and payment is Jan. 15, 1927. Directly after Oct. 15, 1926, you will be informed further as to the situation." The company has notified the Massachusetts Commission of Corporations that it has voted to authorize an issue of 15,410 additional shares of 6 per cent preferred stock, par $100, which will be held for exchange of 5 per cent convertible mortgage bonds, due 1944, as they are offered.

Standard Gas & Electric Diversifies Risk

Huge Utility Earns Bond Interest Nearly Five Times—Earnings on Common Decline Temporarily as New Properties Are Added

DIVERSIFICATION of risk as well as increased strength through consolidation is exemplified to a remarkable degree in the Standard Gas & Electric Company. With properties scattered to the four corners of the United States, yet financially one, this huge organization is building for future solidarity, increased earnings and better service. Gross earnings are more than $140,000,000, taking the system as a whole; assets are above $900,000,000; the company serves 5,500,000 people in nineteen states. These figures help to picture the enormous size of the organization.

The sale last week of $7,500,000 6 per cent debentures is a further step in the new financing undertaken some time ago. Under the plan adopted new and important units have been added and the capital structure of the parent company has been materially simplified. The current issue, in fact, is to reimburse the company for expenditures for new property.

Despite this addition to the company's obligations, earnings of $7,736,536 for the year ended June 30 are more than 4.29 times the $1,800,000 yearly interest required. Earnings of the entire system for the same period applicable to interest charges were $13,623,311, or more than 7.56 times annual interest. It might be expected that these large additions would jeopardize earnings on common for the present. Holding-company common stocks are judged by the proportion of gross revenue remaining to the common after all charges and prior dividends are met. In the case of Standard Gas & Electric earnings on common have declined slightly over the past three or four years, but are still on a $4.23 basis, and the average for the past five years was $6.05. Last year the three preferred issues earned $31.80, $14 and $3.30 a share respectively.

Diversification already mentioned is broader in the case of this company than a mere geographic distribution. A balance is maintained, apparently, between rapidly growing communities where capacity as yet exceeds requirements, and thickly populated, thoroughly developed areas. There is also diversification of activity, the range of companies covering electric power and light plants, both steam and hydro-electric, gas, oil and telephone service.

The capital structure of the parent company consists of a fifteen-million-dollar issue of 6 per cent gold debentures due 1951 and a fifteen-million-dollar issue of gold notes due 1935, making a bonded indebtedness of $30,000,000; $21,000,000 in 7 per cent cumulative prior preference stock; $25,887,600 of 8 per cent cumulative preferred stock and $1,000,000 of 6 per cent non-cumulative stock. There are 1,227,817 shares of no-par common.

Company Reports

The following statements of earnings have been issued by electric light and power companies for the month of August:

Name of Company	Gross Earnings for August 1926	1925
American Water Wks. &Elec.	$3,637,648	$3,322,257
Brazilian Trac., Lt. & Pwr.	3,476,995	2,805,346
Carolina Power & Light	692,212	522,051
Dominion Power & Trans.	258,828	254,462
Fort Worth Power & Light	224,972	224,546
Idaho Power	258,651	255,061
Nebraska Power	333,352	315,580
Pacific Power & Light	307,227	298,138
Texas Power & Light	588,457	520,765
Utah Power & Light	857,295	829,611

Dividends Declared

The quarterly dividends listed below have been announced by electric light and power and electrical manufacturing companies:

Name of Company	Per Cent	When Payable
American Light & Traction, com.	2	Nov. 1
American Light & Traction, pf.	1¾	Nov. 1
American Water Wks. & Elec., com	1¾	Nov. 15
Am. Wtr. Wks. & Elec., 7% 1st pf.	1¾	Nov. 15
Cities Service, Bankers Shares*	16.21c	Nov. 1
Cleveland Electric Illg., com.	2½	Oct. 15
Edison Electric Illg., Boston	3	Nov. 1
Electric Household Utilities, com.	.50	Oct. 20
Electric Investors, $7 pf.	$1.75	Nov. 1
Electric Investors, $6 pf.	$1.50	Nov. 1
Eureka Vacuum Cleaner	$1	Nov. 1
Havana Electric & Utilities, 1st pf.†	$3.00	Nov. 15
Havana Elec. & Utilities, cum. pf.‡	$5.00	Nov. 15
Indianapolis Power & Light, 1st pf.	$1.75	Nov. 1
Lowell Electric Light	.62½	Nov. 1
Mohawk & Hudson Power, pf.	$1.75	Nov. 1
Mohawk & Hudson Power, 2nd pf.	$1.75	Nov. 1
Montreal Water & Power, com.	.62½	Nov. 15
Montreal Water & Power, pf.	1¾	Nov. 15
North Boston Ltg. Properties, com.	$1.13	Oct. 15
North Boston Ltg. Properties, pf.	$1.50	Oct. 15
Pacific Lighting Corp., com.	4	Nov. 15
Pacific Lighting Corp., pf.	1¾	Nov. 15
Superheater Company	$1.50	Oct. 15
Utica Gas & Electric, pf.	$1.50	Nov. 1
West Penn Electric, 7% pf.	1¾	Nov. 15

* Monthly. †Semi-annual. ‡Annual.

Gets Narragansett Control

New England Power Association Obtains a Majority Stock Interest in Providence Utility

ONE of the most important changes in public utility control ever recorded in New England was announced last week at Providence, R. I., when New England Power Association interests secured a majority of the stock of the Narragansett Electric Lighting Company. Bodell & Company, Providence, Bond & Goodwin, Inc., Boston, and other banking interests have been seeking to secure control of the company with the expectation of merging it with the United Electric Railways Company of Providence, and New England Power Association interests have been actively concerned in the project. Last July the Rhode Island Public Service Company proposed a plan for the deposit of Narragansett stock for the purpose of consummating the merger, and on Sept. 16 an offer of $86 per share in cash for Narragansett stock was made by Bond & Goodwin, Inc. Believing that most of the Narragansett stockholders were opposed to accepting these offers, the directors advised against the deposit or sale of the stock under either proposal. In a statement to stockholders dated Oct. 7 President E. A. Barrows of the Narragansett company announced the transfer of control and said that the directors have obtained from the merger group the following offer:

Until Oct. 16 the offer to pay $86 in cash per share of Narragansett stock will hold good. In addition, if by that date or later 80 per cent of the Narragansett stock is acquired by the merger group, all persons who have sold their stock to Bond & Goodwin, Inc., or who shall then hold certificates of deposit under the plan and agreement, will receive appropriate certificates or warrants entitling them to the following privileges with respect to each share of Narragansett stock so sold or deposited: (1) A right to subscribe on or before Dec. 15, 1926 (or later), to one share of Rhode Island Public Service Company cumulative preferred stock at $29 per share and accrued dividends; (2) a warrant which may be credited for 70 cents on any such subscription or at the option of the holder will be redeemed in cash at that amount not later than March 15, 1927; (3) a warrant which, if the preferred stock of the Service company shall be available for delivery in accordance with the plan and agreement, may be credited for 30 cents on any such subscription or, at the holder's option, redeemed in cash. The cumulative preferred stock of the Service company carries dividends of $2 a year and at $29 will net the holder approximately 6.9 per cent. It is callable at $33 per share. The directors state that after exhausting every resource open to them they believe that the above is the best proposition available.

Central Illinois Company Seeks to Issue Bonds.—The Central Illinois Public Service Company is asking the Illinois Commerce Commission for permission to issue first mortgage and refunding bonds, series D, to the amount of $4,615,900.

Manufacturing and Markets

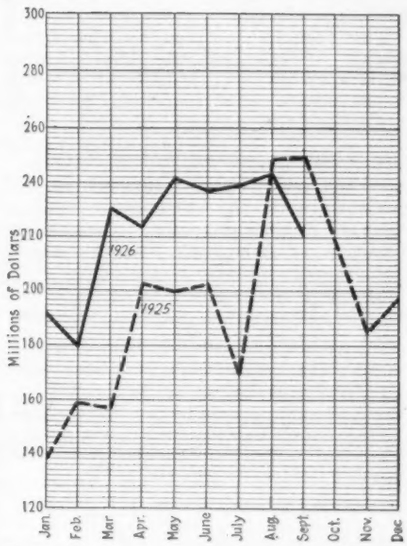
Construction Contracts in September Decrease

Those Awarded Up to Date About 17 per Cent Higher than for Same Period Last Year

ENGINEERING construction contracts awarded in the entire United States during the month of September fell off more than 10 per cent as compared with those of the same month last year. However, contracts awarded from Jan. 1 to Oct. 1, 1926, reached the unprecedented total of $2,178,579,000, and compare with $1,848,907,000 for the corresponding period last year. This lead of about 17 per cent justifies the belief, according to the *Engineering News-Record*, that in engineering construction at least 1926 is evidently destined to be the record year in the history of the industry. The value of contracts let, as shown in the accompanying table, includes everything at or above the following minimum in each class: Waterworks and excavating projects, $15,000; other public works, $25,000; industrial buildings, $40,000, and commercial, educational, religious and other buildings, $150,000.

The construction volume index number for the month of September is 227, which compares with 201 for the whole of 1925 and 100 for 1913. This index number is a measure of the actual volume of contracts let and not the mere money value of the contracts. This index number contains the increment of construction and indicates the actual rate at which construction contracts are being let as compared with contracts let in 1913.

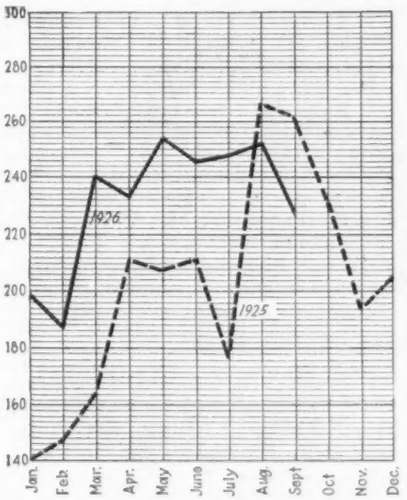
All classes of construction show substantial gains over the cumulative totals at this time last year, except the one comprising excavation, drainage, irrigation, levee, river and harbor work. Seventeen of the 48 states showed more than a seasonal falling off in contract letting during the last month. These states were Maine, New York, Maryland, West Virginia, North Carolina, South Carolina, Florida, Alabama, Mississippi, Kentucky, Ohio, Illinois, North Dakota, South Dakota, Nebraska, Oklahoma and Nevada.



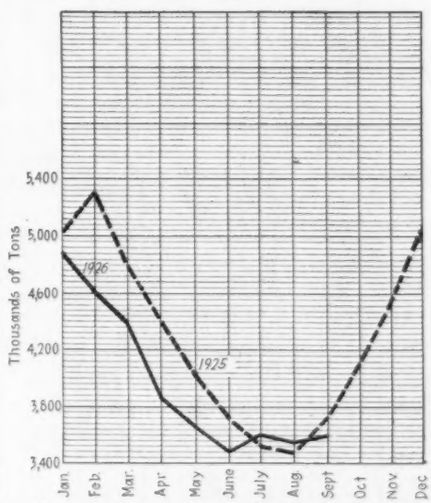
CONTRACTS AWARDED IN THE UNITED STATES

Building projects definitely reported as proposed for the entire United States at the minimums mentioned, Jan. 1 to Oct. 1, 1926, totaled $2,400,521,000. This represents a gain of 17 per cent compared with the corresponding period last year. Construction other than buildings for the country as a whole proposed during the period Jan. 1 to Oct. 1, 1926, totaled $1,845,200,000, a gain of 26 per cent compared with the same months in 1925. A sustained heavy volume of engineering construction awards thus seems assured for several months to come, according to these proposed jobs.

September contract totals, corrected for cost inflations (labor and materials) occurring between 1923 and 1926 and reduced to percentages of the 1913 base, show the actual volume of contract lettings as follows: 1923, 166; 1924, 159; 1925, 262, and 1926, 227.



CONSTRUCTION VOLUME AS COMPARED WITH AN INDEX OF 100 FOR 1913



UNFILLED TONNAGE AS REPORTED BY THE UNITED STATES STEEL CORPORATION

In the chart at the left the actual volume of construction is compared and not the mere money value of contracts let. (*Engineering News-Record* statistics.)

VALUE OF CONTRACTS LET IN THE UNITED STATES AND CANADA, SEPTEMBER, 1926

	New England	Middle Atlantic	South	Middle West	West of Mississippi	Far West	United States	Jan. 1 to Date U.S.	Canada
Waterworks	$1,628,000	$511,000	$158,000	$2,177,000	$1,294,000	$2,948,000	$8,716,000	**$48,017,000**	$225,000
Sewers	859,000	3,378,000	349,000	3,147,000	1,756,000	1,782,000	11,271,000	**76,032,000**	375,000
Bridges	525,000	5,668,000	2,613,000	1,202,000	1,522,000	715,000	12,245,000	**65,677,000**	45,000
Excavating, drainage, irrigation	83,000	447,000	189,000	474,000	.....	33,000	1,136,000	**20,602,000**	831,000
Streets and roads	2,981,000	12,024,000	8,920,000	12,881,000	10,250,000	8,156,000	55,212,000	**393,724,000**	1,430,000
Industrial building	3,255,000	3,531,000	2,815,000	10,406,000	7,485,000	2,087,000	29,579,000	**243,146,000**	50,000
Commercial building	22,259,000	41,244,000	7,102,000	30,573,000	24,579,000	15,453,000	142,210,000	**1,118,118,000**	5,014,000
Federal government	194,000	1,067,000	1,106,000	873,000	2,357,000	102,000	5,699,000	**44,162,000**	.....
Unclassified	1,836,000	2,157,000	102,000	1,477,000	3,098,000	1,619,000	10,299,000	**169,101,000**	284,000
September, 1926	$33,620,000	$70,027,000	$24,354,000	$63,210,000	$52,341,000	$32,905,000	$276,457,000	**$2,178,579,000**	$8,254,000
August, 1926	17,977,000	76,648,000	19,767,000	65,070,000	38,393,000	25,161,000	243,016,000	.....	7,444,000
September, 1925	22,386,000	94,338,000	50,621,000	34,443,000	38,750,000	8,270,000	248,808,000	.....	3,321,000
Jan. 1 to date, 1926	**188,790,000**	**662,994,000**	**226,625,000**	**533,042,000**	**341,443,000**	**225,685,000**	**2,178,579,000**	.....	95,096,000
Jan. 1 to date, 1925	153,355,000	664,654,000	183,220,000	321,883,000	325,770,000	200,025,000	1,,848,907,000	.....	62,843,000

NOTE.—Owing to five weeks of construction contracts being included in some months, as in September, the figure for the total contracts let, as shown in the table, do not agree with the figure as represented in the curve. In order to obtain comparable figures the curve is worked out on a four-weeks basis for each month.

Higher Degree of Activity

General Industry Increased Activity During September, but Some Industries Operated Under August

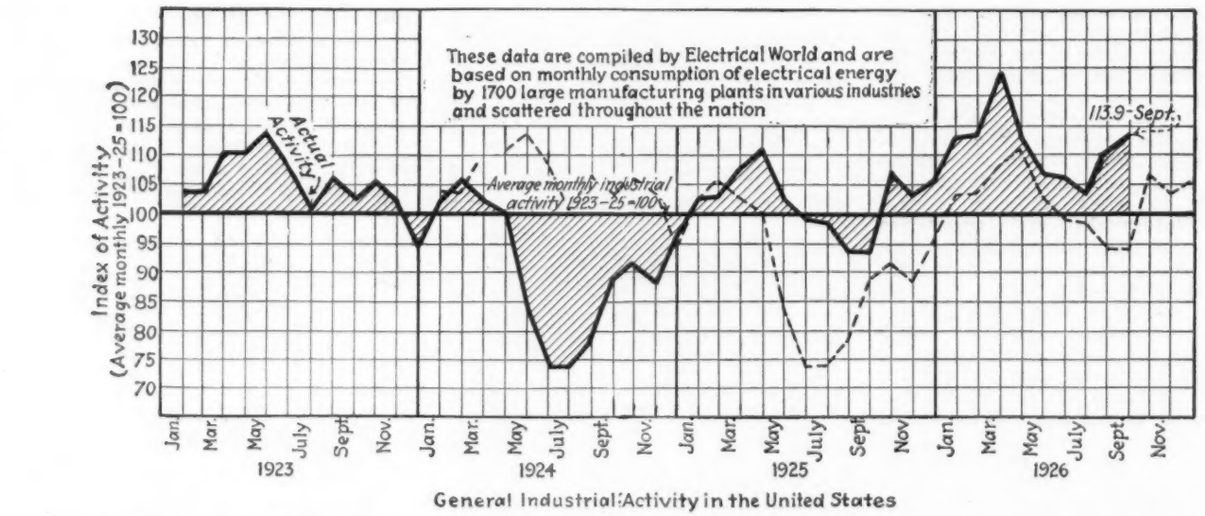
Activity in the manufacturing plants of the nation during September was greater than that reported for August and materially above that of September last year. The metal, textile and lumber industries reported increased operations over August, but September operations in the automotive, the leather and the stone, clay and glass industries were slightly below those of August. September manufacturing activity in general was about 20.7 per cent over that reported for September of last year and 13.9 per cent above the average monthly activity for the past three years. Such is the picture of industrial operations outlined in the data received by the ELECTRICAL WORLD and based upon the monthly consumption of electrical energy by about seventeen hundred manufacturing plants in various industries and scattered throughout the nation—plants consuming about eight billion kilowatt-hours per annum.

The returns received by the ELECTRICAL WORLD indicate that during September general industrial activity in the nation as a whole was 13.9 per cent above the average monthly industrial activity for the past three years, this figure being unadjusted for seasonal variation and weighted in accordance with the importance of the various industries. The prosperous condition of American industry today is even more clearly indicated when the fact is included that in September of last year general industry in the nation as a whole was operating at 5.7 per cent below the average monthly.

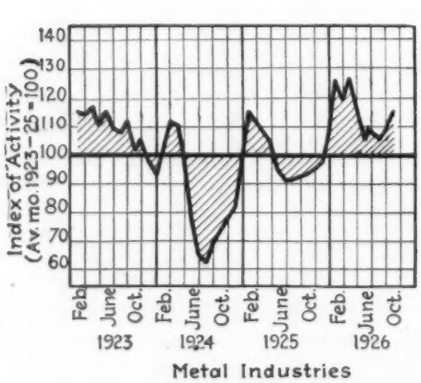
The metal industries taken as a group were operating at 5.7 per cent above August and 16.7 per cent over the activity reported for September of last year. Activity in the automotive industry during September was 2.4 per cent under that reported for August, but was still 28.6 per cent over September of last year. The textile plants continued their upward trend, which was started in August, the September activity being 7.1 per cent over August and 4.6 per cent over September of last year. Operations in the leather and in the stone, clay and glass industries were under those of August.

"Electrical World" Barometer of Industrial Activity in the United States as a Whole

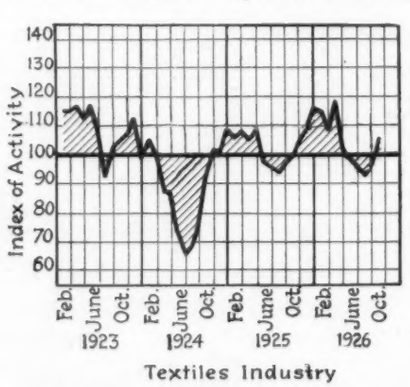
(Data Unadjusted for Seasonal Variation)


These data are compiled by Electrical World and are based on monthly consumption of electrical energy by 1700 large manufacturing plants in various industries and scattered throughout the nation
Index of Activity (Average monthly 1923-25 = 100)
Actual Activity
Average monthly industrial activity 1923-25=100
113.9-Sept.
Jan. Mar. May July Sept. Nov.
1923 1924 1925 1926

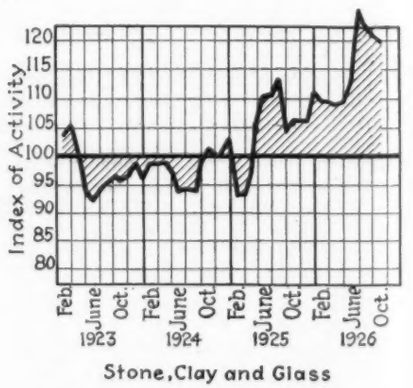
General Industrial Activity in the United States



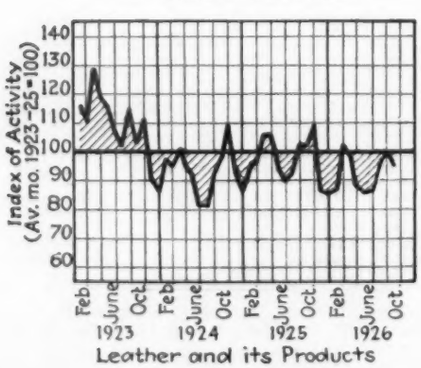
Metal Industries



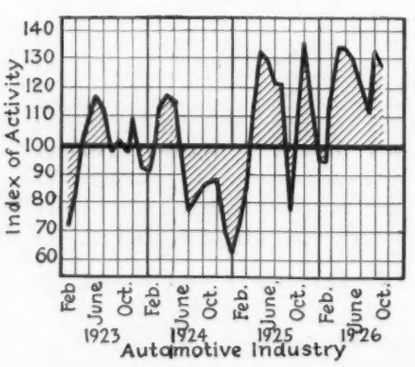
Textiles Industry



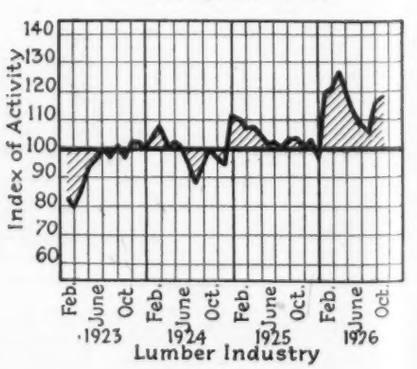
Stone, Clay and Glass



Leather and its Products



Automotive Industry



Lumber Industry

Federal Anti-Trust Decree

Consent Order in Case of the Southern Hardware Dealers Bears on Scope of Trade Associations

FUNDAMENTALS common to all trade associations are involved in a consent decree issued a few weeks ago by Judge D. Lawrence Groner in the United States District Court at Richmond, Va., in a suit of the federal government against the Southern Hardware Jobbers' Association and its members. The action filed by the Department of Justice charged violation of the anti-trust laws by an alleged price-fixing combination in hardware, agricultural implements and supplies, 132 corporations, 31 individuals and seven firms being involved in the suit. In its announcement of the consent decree the Department of Justice stated that "Judge Groner's injunction brings to a successful conclusion the government's case. The decree is very broad in its scope, and it is believed that the specific acts of the defendants which it prohibits will insure hereafter free and open competition among them, thus giving the people in that section who purchase hardware, agricultural implements and kindred articles the benefit of competitive prices."

The decree, among other things, enjoins the association from endeavoring to prevail upon jobbers to sell hardware or any commodity at uniform prices or to in any way restrain competition among the jobbers as to prices, endeavoring to prevail upon any manufacturer to suggest or to fix the price at which any article of hardware or any commodity shall be resold by the jobbers, and endeavoring to prevail upon any manufacturer to refrain from selling to a jobber who resells at lower than the suggested resale prices.

The specific acts charged against the association were thus enumerated:

"The defendant jobbers, acting concertedly through defendant association: (1) For several years endeavored and are now endeavoring to compel all manufacturers selling hardware in the Southern territory to conduct their business along lines approved by the defendant association, and have succeeded in coercing many of such manufacturers into conforming to the policies of the defendant association, viz.: (*a*) To suggest resale prices for their products; (*b*) to refrain from selling to wholesale dealers (jobbers) who in their sales to the retail dealers fail to sell at the resale prices suggested by the manufacturers; (*c*) to sell only to established wholesale dealers (jobbers) as defined by the defendant association; (*d*) to ship to a wholesale dealer (jobber) only to the place of business of the respective wholesale dealer. (2) Agreed among themselves to sell to the retail dealers at the resale prices suggested by the manufacturers."

In all, fourteen prohibitions were made by the decree. As summarized by the counsel for the hardware men, the court's order "permitted the continued existence and functioning of the association, but enjoined it and its members from doing certain things which it and its members have never done and which none desires to do."

Business Conditions

RAILROAD companies continue to be active buyers in the electrical market. Utility companies are steady buyers, but their activity is not so marked owing to the placing of no especially large orders. One order placed for storage-battery equipment by a central-station company in the Middle West amounted to about $500,000. Industrial electric heating apparatus is especially active. The General Electric Company announced that its sales for the quarter ended Sept. 30 were $81,587,917. This is an 11 per cent increase as compared with the corresponding quarter last year. Sales of the same company for the nine months ended Sept. 30 were $246,993,637. As compared with the same period last year a 10 per cent increase is registered. A number of manufacturers in the industry report increases in sales for the first nine months of the year, and the general belief is that orders to be placed during the last quarter of the year will compare favorably with corresponding periods. The United States Steel Corporation reported its unfilled orders on Sept. 30 as showing an increase of 51,174 tons.

In New England less general activity in buying is reported but specialties are attracting attention, particularly industrial electric heating apparatus. A number of orders for that type of equipment were placed. Central-station supplies are limited to small orders, industrial electric lighting is gaining in interest, and household appliance sales are maintaining a steady trend. Railroad companies are active buyers in the New York district. Sales in general are spotty, and some increase is noted in orders for motors over 25 hp. in size as well as in the number of inquiries for quotations on such equipment. In the Southeast sales are satisfactory, and industrial business has been somewhat quiet. Fears are expressed that the cotton situation may cause considerable reduction in purchases in the agricultural sections. The demand is steady in the St. Louis district, and manufacturers feel that conditions are first class with no indications of a depression. Industrial plants are active in the Middle West and utility purchasing has been quite large. One order placed covered $500,000 worth of storage batteries. On the Pacific Coast many varied industrial sales were made and several orders for maintenance material were placed by utility companies. Puget Sound companies are quoting on several proposed installations for pulp and paper plants and lumber mills, but few contracts have yet been closed.

Copper Price Strengthens and Buying Becomes Active

Extremely active copper buying, following several weeks of dullness, featured the metal markets. Prices ranged as low as 14 cents delivered, but seemed firm on Wednesday at 14⅛ cents in Connecticut. Lead and zinc have not been active and prices are easier if anything. The announcement on Oct. 11 of the incorporation of Copper Exporters, Inc., and of the tacit approval of the Federal Trade Commission of the plans of American copper producers and associates in Europe, came at a time when the domestic market had sagged close to 14 cents delivered in the Connecticut valleys. Large sales at that figure were made on Monday and on the preceding Friday, although on the same days 14.025 cents, 14.05 cents, and even 14.10 cents were realized. The announcement had an immediate effect on London and quotations strengthened.

NEW YORK METAL MARKET PRICES

	Oct. 6, 1926 Cents per Pound	Oct. 13, 1926 Cents per Pound
Copper electrolytic	14.15	14.15
Lead, Am. S. & R. price	8⅛	8.35
Antimony	13¼	13¼
Nickel, ingot	35	35
Zinc spots	7.65—7.70	7.65
Tin, Straits	71¼	70
Aluminum, 99 per cent	27	27

Base copper price Oct. 13, 1926, 16½ cents.

The American Smelting & Refining Company reduced its contract price for New York lead from 8⅛ to 8.35 cents on Wednesday. The reduction came as somewhat a surprise to the trade, as London made a modest advance on the same day. However, the smelting company's price has recently been shaded slightly by others, particularly for November shipment, and sales for the week have been of exceedingly modest proportions. Practically no interest was shown in tin this week and prices have been somewhat easier. Activity in the zinc market has been only moderate.

Industrial Electric Heating Active in New England

Less activity in buying is reported throughout the New England district. Small-motor sales dropped in volume and few orders of interest were placed for standard electrical equipment and supplies. On the other hand, specialties are attracting some attention, particularly industrial electric heating apparatus. One manufacturer records a number of orders received recently. One of these is for a large heating furnace, costing about $5,000, for a northern New England plant. Another manufacturer reports receiving orders from the Middle West for furnaces totaling about $20,000. Included in these orders are two 30-kw. and one 60-kw. furnace. Negotiations are under way for a number of special-type continuous-heating furnaces for the metal-working industries.

Central-station supplies are limited to small orders. One manufacturer reports steady buying in small lots, with small switches, conduit, hardware and wire moving well. A number of small orders were placed for work on substations in southern New England, and one manufacturer shipped a carload of general supplies to northern New Hampshire. Industrial electric lighting is gaining in interest, and

reflectors and wiring material for this equipment are selling well. Electric refrigeration sales are quiet, but much activity in negotiations is reported by field agents, one of whom records a list of more than three hundred live prospects developed in one week. Household appliance sales are maintaining a steady trend. An encouraging strength in buying is reported, with the demand for the major appliances quite strong. Jobbers' opinions as to present trade conditions are favorable. Sales this month are reported ahead of those of last month.

Railroad Companies Active Buyers in New York District

Sales to central-station companies in the New York district continue dull, although a little improvement is shown in some lines. Distribution transformers and insulators are in fairly active demand, and there is some buying of poles, cross-arms and hardware for line maintenance. The volume of this business is, however, considerably below normal, and there is no activity in generating or switching equipment or control apparatus. Industrial buying, too, is falling off. The demand for motors and control equipments of the smaller sizes so far this month has been less than during the last few months. There is an increase noted in the sales of motors over 25 hp. and also in the number of inquiries for quotations on the larger-sized units. Railroad companies are placing orders for substation and generating equipment, including one 20,000-kva. turbo-generator for which an order has just been placed this week.

Sales in Southeast Satisfactory—Industrial Business Quiet

Business in the Southeast for the past week has been quite satisfactory from the standpoint of both volume and number of orders placed, but there are no outstanding features. Fears are being expressed in financial circles that the break of cotton to 12 cents on the publication of the new government estimate will cause considerable reduction in purchases in the agricultural sections and will undoubtedly cause long delays in payment of accounts generally. The situation has not crystallized sufficiently for definite opinion to be expressed as to the effect that this sharp break in cotton prices will have on the Southern trade this fall.

Orders for farm-lighting outfits have shown considerable strength recently, sales this year through October being 15 per cent ahead of the same period of 1925, and a considerable activity in small electrically driven pumping outfits has also been in evidence. The wide extension of transmission lines by power companies has tended to increase the sale of these outfits very materially, especially in those small communities not now having waterworks systems. Industrial business generally has been somewhat quiet, though here and there are reports of receipt of good orders from the textile interests. A local jobber received an order for $18,000 worth of supplies for a new mill.

Demand Steady in the St. Louis District

Jobbers and manufacturers report good business in the St. Louis district with no spectacular orders. The demand for general lines of merchandise continues to be good and is a fair percentage above that of the same period of last year. The railroads in the district are improving their shop facilities, two of the large systems having purchased more than $20,000 worth of motors for use in their shops on machine tools and miscellaneous boiler and machine-shop equipment. A large box company in Alton, Ill., placed an order for a 1,500-kw. turbo-generator. Negotiations are under way for a number of good-sized central-station units and for a fair amount of industrial equipment. Orders are expected as a result within the next few weeks. Though nothing very large has been closed, the feeling among all of the large manufacturers is that conditions are first class with no indication of a depression.

Industrial Plants Active in Middle West

Industrial activity is noticeable in the Middle West, and the railroads are moving large quantities of all classes of merchandise. Utility purchasing has been quite large, the commitments of one large utility company continuing to average more than $70,000 per day. Considerable buying of apparatus is noticed, among which are two sets of substation type storage batteries valued at $500,000 and 180 pole-type distribution transformers ranging from 25 kva. to 100 kva. Several sizeable inquiries for western red-cedar poles are reported, together with an inquiry for a large quantity of copper busbar. There has been a good demand for maintenance material, and one utility company placed incandescent lamp requirements totaling approximately $350,000. Jobbers' sales remain generally satisfactory. Appliances continue to move steadily, with a particularly large demand noted for washing machines, one jobber placing an order for 750 machines. There has been a good demand for wiring devices, conduit, etc., owing to the continued building activity.

Industrial Companies Active on Pacific Coast

Many varied sales, largely to industrial plants, are reported on the Pacific Coast. An ice company purchased two synchronous motors, each 225 hp.; a cement company bought two centrifugal compressor blowers worth about $3,500 each; a sugar company ordered six mechanical-drive steam turbines in sizes from 25 hp. to 100 hp., and a Nevada copper mine purchased a 1,000-kva. bank of transformers. Other interesting orders from industrial firms comprise 3,000 metal reflectors for the San Diego plant of a can manufacturer, with a prospective inquiry for 7,000 more units for the same company's Sacramento and San Francisco plants, and 60 identical orders from an oil company for lightning-arrester equipment. The latter order resulted from the passage of ordinances owing to disastrous oil-tank fires. Orders from utility companies include special pole-line hardware and other maintenance material. Dealers' business is improving.

Puget Sound companies are quoting on several proposed installations for pulp and paper plants and lumber mills. Sales of motors and heavier apparatus were in comparatively small volume in that section. One order for 50 motors amounting to about $10,000 was placed by a pulp and paper company, a Tacoma woodworking factory placed a contract for about $12,000 worth of motors, and a timber company asked for bids on 35 motors and control equipment for its Newark (N. J.) plant.

Activities of the Trade

Cutler-Hammer Company to Increase Capital Stock

An amendment to its articles of incorporation has been filed by the Cutler-Hammer Manufacturing Company, Milwaukee, increasing its capital stock from $2,000,000 to $6,000,000. Under the amendment the new capitalization will consist of $4,000,000 in preferred stocks, carrying a 7 per cent annual dividend, in addition to the present capital, consisting of $2,000,000 in common stock. The company states that its orders are about 15 per cent ahead of those to date last year.

General Electric Orders for Third Quarter Show Increase

Orders received by the General Electric Company for the three months ended Sept. 30, 1926, total $81,587,917, compared with $73,561,483 for the same quarter in 1925, an increase of 11 per cent, President Gerard Swope has announced. For the nine months of the present year orders total $246,993,637, compared with $223,876,711 for the first nine months of 1925, an increase of 10 per cent. Orders received during the quarter ended June 30 amounted to $78,972,062.

National Pole & Treating Company Formed by Amalgamation

Expansion of the Backus-Brooks and Pendleton-Gilkey interests to include the National Pole Company and the formation of a new amalgamated company with assets of between five and six million dollars have just been announced by H. S. Gilkey, chairman of the board of directors of the new company, which will be known as the National Pole & Treating Company, with headquarters in Minneapolis, and will take rank as the largest producer of cedar poles in the country. The amalgamation includes by purchase from the J. C. Kirkpatrick Estate of

Escanaba, Mich., the assets and business of the National Pole Company and the American Cedar Company and Northern Tie & Treating Company of Minneapolis.

The directors of the new company, which has been organized under the laws of Delaware, are E. E. Backus, Seymour W. Backus, William F. Brooks, F. R. Pendleton and H. S. Gilkey. The officers are H. S. Gilkey, chairman of the board; Seymour W. Backus, president; G. H. Ramsey, L. A. Furlong and F. G. Moore, vice-presidents, and William F. Brooks, secretary and treasurer. Vice-president Ramsay, formerly assistant to President Allen Bole of the National Pole Company, will have charge of the pole department; Vice-president Furlong will continue in charge of the post and tie departments, and Vice-president Moore will continue in charge of operating the yards and treating plants of the company. The men named, together with John Junell, F. B. Thompson, C. B. Nield, and C. Hertel, comprise the stockholders of the new company.

For many years the National Pole Company has been the largest single producer of cedar poles in the world. The American Cedar Company and Northern Tie & Treating Company have also been for many years large producers of poles, posts and railroad ties and have operated extensive treating plants. The company just formed will have supply yards at strategic points. It has treating plants at Minnesota Transfer and at Everett and Spokane, Wash. The first-named is one of the largest and most complete wood-preserving plants in the world, treating poles, posts, ties and lumber.

The company will hold a strong position in the distribution of its poles through its sales contract with the Graybar Electric Company, which has distributing warehouses and sales offices in approximately 60 cities in the United States, and through its contract with Western Electric Company, which supplies a substantial share of the cedar poles used by the Bell Telephone System throughout the country.

The Century Electric Company, St. Louis, manufacturer of alternating-current motors and fans, will open a district office at 405 Kahl Building, Davenport, Iowa, on Nov. 1. H. E. Johnson, who has been in charge of the Century interests in Des Moines, will be manager of the Davenport office.

The New England Butt Company, Providence, R. I., builder of braiding machinery and wire-rope machinery, announces the opening of a Chicago office at 140 South Dearborn Street, in charge of W. A. Richards.

The Chicago Pneumatic Tool Company, 6 East Forty-fourth Street, New York, manufacturer of motor-driven and pneumatic drills, hammers, etc., is reported to be planning the construction of a new half-million-dollar plant at Franklin, Ill., for the manufacture of Diesel engines.

The P. A. Geier Company, Cleveland, announces a 22½ per cent reduction on its "Royal" standard cleaner and attachments. The company states that no change whatever has been made in the design or the construction of this cleaner. No change in price has been made in the "Superoyal" cleaner, also manufactured by the company.

The Power Specialty Company, 111 Broadway, New York, manufacturer of superheaters, economizers, water-cooled furnaces and coal pulverizers, announces the opening of a branch office at Room 709, Security Building, 209 Grant Avenue, Milwaukee.

The Cooper-Hewitt Electric Company, Hoboken, N. J., has asked for bids on a general contract for the erection of its proposed four-story addition, 80 ft. x 200 ft.

The Doyle-DaCosta Manufacturing Company, Easton, Pa., manufacturer of electrical coils and windings, announces that since Oct. 15 it has changed its name to the Coilton Electric Manufacturing Company, in order to express better the field of activity in which it engages. William L. Doyle, president of the company for the last ten years, has resigned, and George B. Sherry of Easton has been appointed president to succeed Mr. Doyle. The company is planning an expansion program which will double its capacity.

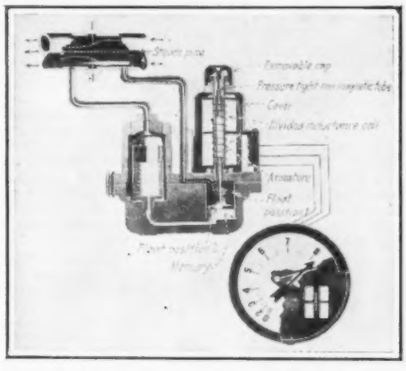
The Copperweld Steel Company, Rankin, Pa., announces that C. J. Spindler, formerly in the valuation and rate department of the Illinois Power & Light Corporation, Chicago, has been appointed a representative of Copperweld with the Steel Sales Corporation. Mr. Spindler will represent the Copperweld company in Illinois, Wisconsin and Michigan.

The Westinghouse Electric & Manufacturing Company has received an order from the Pennsylvania Railroad for 93 motor-driven coaches and four electric passenger locomotives for use on lines between Philadelphia and Wilmington.

New Equipment Available

Flow Meter

An electric flow meter operating on the induction bridge principle and having several new features has been developed by the Brown Instrument Company, Philadelphia. In this instrument the readings are fundamentally independent of the value of voltage impressed upon the electrical system. The electrical circuits at the



THE BROWN ELECTRICALLY OPERATED FLOW METER USING THE INDUCTANCE BRIDGE PRINCIPLE

manometer, indicator and recorder consist simply of stationary divided inductance coils. These have only three connections which are permanently made at the time of installation, and no make-and-break contacts are used. All electrical windings and connections in the manometer or meter body are entirely external to the pressure chamber. The integrator is a mechanical device operated by an electric clock which drives the charts. An equal amount of power is available for operating the integrator at all rates of flow and an easily read type of five-figure counter is used for the integrator. A pen operated by the action of the integrator mechanism makes a record at the outer edge of the chart each time the integrator mechanism increases the counter reading by one unit. Each tenth mark is distinguishable from the intermediate marks in order to facilitate counting when it is desirable to determine the total flow for any period of the day. The entire integrator mechanism with its individual recording pen is compact and can be mounted in the standard recorder case along with the recording mechanism so that a separate integrator case is not necessary.

A series of printed charts are chosen with a fixed ratio between successive ranges. The manometers also are arranged to be adjusted for several appropriate ranges. This simplifies the choice of an orifice plate, the size of which depends chiefly upon the density of the fluid and the pipe size. With such an orifice the apparatus is easily adjusted for successive chart ranges by using a standpipe of proper size in the manometer. This may be used where the average load changes from time to time, for then the apparatus can be readjusted by changing the manometer standpipe instead of changing the orifice plate.

The various manometers for use with steam operate on successive maximum pressure differentials increasing by intervals of about 60 per cent, ranging from 1.6 in. to 16 in. of mercury. There are six ranges in this series, the choice of a suitable manometer depending upon the velocities encountered. Any manometer of the series, however, may be converted into the most sensitive one by simply opening a valve. This adapts the meter for use with one of the lower-range charts, making it easily convertible for low-load periods. Where the apparatus must work on very low-pressure differentials an especially sensitive type of manometer is provided, the most sensitive of which gives full deeflction of the meter on a pressure difference of ½ in. of water, although the operating force of the meter mechanisms of this high-sensitivity series is as great as that of the high-range manometers.

New Trade Publications

SAFETY SWITCHES, POWER PANELS, ETC.—The Square D Company, Detroit, Mich., has issued catalog No. 32, covering its products, including safety switches, switch boxes, motor starter, porcelain insulators, power panels, test plugs and sockets, voltage testers, etc. Tables giving dimensions of switch boxes in inches and knockout sizes and locations and wiring data for motors are included. In the issue of Oct. 9 the catalog number was erroneously given as 36 instead of 32.

LOCOMOTION.—"Clearing the Way for the Comforts of Life" is the title of a booklet issued by the Ingersoll-Rand Drill Company, 11 Broadway, New York City, embracing a brief narrative of the development of American motive power from its earliest days (1826) and leading up to the recent advent of the oil-electric locomotive in 1926. Attention is called to the advantages of the oil-electric lomocotive and the economies already effected by it.

AUTOMATIC ELECTRIC CONTROL.—The Cobb Electric Appliance Company, 100 Massachusetts Avenue, Boston, is distributing a leaflet covering its automatic electric control for temperature, pressure or vacuum.

STARTING SWITCHES. — The Allen-Bradley Company, 286 Greenfield Avenue, Milwaukee, is distributing revised price sheets on its type J-1552, form M, and type J-1552, form T, across-the-line starting switches and type J-3052 automatic resistance starter.

MERCURY-ARC RECTIFIERS. — Descriptive circular No. 301 issued by the American Brown Boveri Electric Corporation, 165 Broadway, New York City, covers the Brown Boveri mercury-arc power rectifiers for manual or automatic control. It contains illustrations showing various types of rectifier equipments and line drawings showing a typical power-rectifier substation. Curves showing the comparative performance of the mercury-arc rectifier and the rotary converter under various loads are included.

OUTDOOR METER CABINETS. — A leaflet distributed by the Packard Electric Company, Warren, Ohio, describes and illustrates the Packard outdoor metering cabinets developed for use with the Packard line of weatherproof metering transformers.

TOOLS FOR ELECTRICIANS, LINEMEN, ETC.—Catalog No. 26 issued by Mathias Klein & Sons, 3200 Belmont Avenue, Chicago, covers the Klein line of tools for electricians, linemen and mechanics, including pliers, splicing clamps, pole climbers, grips, tree trimmers, linemen's torches, etc.

INDICATORS.—Bulletin No. 203 issued by Morey, Jones & Lovell, 810 West Sixth Street, Los Angeles, describes the "M.J.L." flow indicators for measuring the flow of gas, air, steam or liquids under all conditions. It contains illustrations of various types of the "M.J.L." indicators, and also line drawings showing typical installations of the indicators.

TURBO-COMPRESSORS AND BLOWERS.—The American Brown Boveri Electric Corporation, 165 Broadway, New York City, has issued descriptive catalog No. 200, covering the various types of its turbo-compressors and blowers, including turbo-blowers for steel plants, blast furnaces, scavenging turbo-blowers for Diesel engines and turbo-gas exhausters and gas boosters. It contains a line drawing showing the arrangement of a typical Brown Boveri turbo-compressor plant, including the compressor, steam turbine, continuous service condenser and pump sets.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

An agency is desired in Berlin, Germany (No. 22,383), for electric dish-washing and household machines, and refrigerating machines.

Purchase and agency are desired in Victoria, Brazil (No. 22,443), for electrical goods.

An agency is desired in Hamburg, Germany (No. 22,402), for electrical household appliances.

An agency is desired in Wellington, New Zealand (No. 22,431), for electrical household appliances and lighting fixtures.

Purchase and agency are desired in Vienna, Austria (No. 22,400), for electrically driven nailing machines with automatic feed.

Purchase is desired in Soerabaya, Java (No. 22,460), of radio parts, especially ebonite in sheets; also for electrical refrigerators (No. 22,461).

An agency is desired in Manaos, Brazil (No. 22,458), for radio sets and parts.

Purchase and agency are desired in Stockholm, Sweden (No. 22,459), for radio transformers and condensers.

An agency is desired in Paris, France (No. 22,401), for electrical refrigerators.

An agency is desired in Leipzig, Germany (No. 22,382), for electrically operated duplex grinding and polishing machines, and drilling machines.

Purchase is desired in Auckland, New Zealand (No. 22,373), of cans for dry-cell batteries.

Construction News

Projects, Plans, Bids and Contracts, Contemplated or Under Way

New England States

CONCORD, N. H.—Bids are being taken for the construction of a power plant for the Saint Pauls School, to cost about $40,000. French & Hubbard, 210 South Street, Boston, are engineers; Day & Klauder, 1,416 Chestnut Street, Philadelphia, are architects. J. Walker is business manager.

PORTSMOUTH, N. H.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Oct. 19, for 100,000 incandescent lamp waterproof sockets (Schedule 6064).

BOSTON, MASS.—The Edison Electric Illuminating Company of Boston has applied to the Department of Public Utilities for an approval of a contract providing for the sale of electricity to the Eastern Massachusetts Electric Company.

CAMBRIDGE, MASS.—Bids, it is understeed, will soon be asked by the Middlesex County Commission for a steam power plant for the county jail, to cost about $150,000.

NORTHAMPTON, MASS.—Bids will be received by the United States Veterans' Bureau, Room 791, Arlington Building, Washington, D. C., until Nov. 9, for the construction of continued treatment building No. 6, attendants' quarters additions, and extensions of covered walks at the United States Veterans' Hospital No. 95, Northampton. The work will include plumbing, heating, electrical work and outside service connections, etc. Frank T. Hines is director.

WESTFIELD, MASS. — Application has been made by the Turners Falls (Mass.) Power & Electric Company to the Department of Public Utilities for authority to erect a transmission line from Westfield to Chester, passing through Westfield, Russell, Montgomery, Huntington and Chester.

Middle Atlantic States

ANDOVER, N. Y.—The village officials have entered into a contract with the Niagara, Lockport & Ontario Power Company, Buffalo, whereby the company will supply electricity for the municipal electric system. The contract calls for not less than 27,000 kw. per month.

BROOKLYN, N. Y.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Oct. 19, for 7500 searchlight carbons for the local navy yard (Schedule 6086).

BUFFALO, N. Y.—Electric power equipment will be installed in the proposed flour mill and elevator to be erected at Catherine Street and the Buffalo River by the International Milling Company, Minneapolis, Minn., to cost about $1,000,000.

ITHACA, N. Y.—The New York State Gas & Electric Company has applied for permission to extend its electric lighting systems in Fairmont and New Berlin and for approval of local franchises. The company proposes to erect 11 miles of distribution lines in Fairmont, and to extend its service in New Berlin to cover the entire town.

JAMESTOWN, N. Y. — Electric power equipment will be installed in the proposed plant to be built by the Jamestown Metal Desk Company, to cost about $115,000.

ONEIDA, N. Y.—The Adirondack Power & Light Corporation, Schenectady, is building a new substation at Oneida, in which all its high-tension lines in this section will be centered.

ROCHESTER, N. Y.—The Rochester Gas & Electric Company has petitioned the Public Service Commission for permission to build a new steam plant at Lincoln Park.

SANGERFIELD, N. Y.—The Town Board has created a lighting district, extending from the Waterville Corporation line to Weightman Place. Street-lighting service is supplied by the Norwich plant of the New York State Gas & Electric Corporation, Ithaca.

ASBURY PARK, N. J.—The Jamesburg Ice Company plans to install electric power equipment in connection with the rebuilding of its ice plant, recently damaged by fire with loss of about $100,000.

ATLANTIC CITY, N. J.—Bids will be received by the Board of Commissioners of Atlantic City, City Hall, until Nov. 4, for construction of the convention hall. Separate bids will be received for the following divisions of the work: General construction, heating and ventilating, plumbing, electric work, fire protection, ice skating rink and elevators. Lockwood, Greene & Company, Inc., 24 Federal Street, Boston, and Pershing Square Building, New York City, is engineer; Alexander H. Nelson, Guarantee Trust Building, Atlantic City, is associate engineer.

NEWARK, N. J. — All bids submitted Sept. 27, in connection with extensions to City Hall, including power plant, have been rejected by the Department of Parks and Public Property. New bids will be asked for.

POMPTON LAKES, N. J.—The Jersey Central Power & Light Company, Morristown, which has purchased the municipal hydro-electric plant, contemplates extensions and improvement to its system in this section.

CENTERVILLE, PA.—The West Penn Power Company has been granted permission to erect a transmission line over the Monongahela River in this section.

PHILADELPHIA, PA.—The directors of the Philadelphia Rapid Transit Company, Philadelphia, have authorized an issue of $5,000,000 in capital stock, for expansions to its system. Of this amount $1,700,000 will be used for extensions and improvements to the regular traction system, including electric stations, transmission and distribution lines and car houses.

POLAND MINES, PA.—Bids are being taken by the Shannopin Coal & Coke Company, 311 Ross Street, Pittsburgh, for a coal mine development here, including blacksmith shop, lamp house, substation, fan house, warehouse, office and administration building, to cost about $100,000. G. B. Baton Company, First National Bank Building, Pittsburgh, is engineer.

BALTIMORE, MD. — The Bethlehem Shipbuilding Corporation plans to install electric power equipment in its proposed additions on the Key Highway, to cost about $1,000,000.

BALTIMORE, MD. — Electric power equipment will be installed in the proposed plant to be erected by the Maryland Meter Works, 309 East Saratoga Street, at Holliday and Dickey Streets, to cost about $250,000, for which bids will soon be asked on revised plans. Theodore W. Pietsch, American Building, is architect.

MARTINSBURG, W. VA.—The Berkeley Woolen Company plans to install electric power equipment in its proposed addition, to cost about $200,000.

NEW MARTINSVILLE, W. VA.—The installation of a new street-lighting system here is under consideration by the City Council.

PENNSBORO, W. VA.—The Monongahela West Penn Public Service Company plans the construction of a transmission line from St. Mary's to this place, by way of Ellensboro.

VIRGINIA BEACH, VA.—The installation of an ornamental lighting system in

connection with a proposed walkway on the ocean front, for a distance of about 1 mile is under consideration by the Walkway Committee. The entire project will cost $275,000. D. B. Ryland is secretary.

North Central States

BAY CITY, MICH.—The installation of an ornamental lighting system on Midland Street from Third Street to the Michigan Central Railroad crossing has been approved by the City Commission.

DETROIT, MICH.—Plans have been prepared by the Burroughs Adding Machine Company, 6071 Second Boulevard, for extensions and improvements in its power house, to cost about $45,000. Albert Kahn, Marquette Building, is architect.

IRON MOUNTAIN, MICH.—The installation of ornamental lighting system on Carpenter Avenue, covering a distance of about 1 mile, is under consideration by the City Council.

PONTIAC, MICH.—The City Council is considering an issue of $30 000 in bonds for extensions in the municipal fire-alarm and police-signal systems.

PORT HURON, MICH. — Arrangements are being made by The Detroit Edison Company, for extensions and improvements to its power plants and transmission system in this section, to cost about $1,000,000.

ST. JOHNS, MICH.—Contracts will soon be awarded by S. L. Marshall, secretary of the Clinton Memorial Association for construction of hospital building and power plant, with steam heating system, to cost about $150,000.

CINCINNATI, OHIO. — The Goldsmith Metal Lath Company, Third Street and Eggleston Avenue, plans to install electric power equipment in a proposed addition to its plant, to cost about $125,000.

CINCINNATI, OHIO. — The Board of Trustees, University of Cincinnati, contemplates extensions and improvements in the power plant at the college, including installation of additional equipment. The work will be carried out in conjunction with a new service building and library. The cost of the entire project is estimated at $1,000,000.

MANSFIELD, OHIO.—The City Council is negotiating with the Ohio Public Service Company for the installation of a new street-lighting system.

SHARONVILLE, OHIO.—The Big Four Railroad, Cincinnati, is planning extensions in its power plant in connection with proposed extensions in the local yards and shops. The cost of the entire project is estimated at $1,200,000.

TIFFIN, OHIO.—The City Council has authorized Joseph C. Arnold, Service Director, to obtain bids for a new street-lighting system, including an ornamental lighting system on Washington, Perry, Market, Madison and Courts, consisting of 132 posts mounted with 600-cp. lamps.

IRVINE, KY.—Surveys are being made by the Kentucky-Tennessee Light & Power Company, Bowling Green, for the erection of a transmission line to connect Irvine with Beattyville. H. D. Fitch is president.

MAYFIELD, KY. — Surveys are being made by Kentucky-Tennessee Light & Power Company, Bowling Green, for the erection of a 33,000-volt transmission line from Mayfield to Murray. The company is also erecting a 33,000-volt line from Mayfield to Fulton, Ky., to connect with its Tennessee system. H. D. Fitch is president.

AUBURN, IND.—Improvements to the local service are contemplated by the Indiana Service Corporation, Fort Wayne, including the erection of a new transmission line from the substation on the Leo Road to Auburn, to cost about $75,000.

TRAFALGAR, IND. — The Trafalgar Light & Power Company, recently organized, plans to furnish electricity for lamps and motors in Trafalgar. Norman C. Evans and James I. Murray are among the incorporators.

ATLANTA, ILL.—The Atlanta Water & Light Company has petitioned for authority to supply electricity for light and power in Lawndale.

CHICAGO, ILL.—The Eagle Tank Company, 2450 North Crawford Street, plans to install electric power equipment in a proposed plant addition, to cost about $160,000.

FOND DU LAC, WIS.—Plans are being prepared by the Wisconsin Power & Light Company, Madison, for an addition to its local plant, to cost about $40,000. Balch & Lippert, Gay Building, Madison, are engineers.

LUCK, WIS.—The Luck Light & Power Company plans to erect 2½ miles of transmission lines to serve a farming district.

MILWAUKEE, WIS.—Contract has been awarded by the Rundle Manufacturing Company, for building a boiler house and extension to power plant. Cahill & Douglass, 217 West Water Street, are engineers.

WALES, WIS.—The construction of a power plant at the local State Sanitorium, to cost about $50,000, is under consideration by the State Board of Control. A. W. Bagley, Madison, is secretary.

BLOOMING PRAIRIE, MINN.—The Interstate Power Company, Chicago, Ill., has authorized the erection of a transmission line, 16 miles long, in this district.

MINNEAPOLIS, MINN. — The Northwestern Bell Telephone Company is planning to change its Hyland exchange at 2,102 Bryant Avenue North from manual to automatic service, at a cost of $800,000. The work includes a power plant, wire terminals, new cables, instruments, etc.

ST. PAUL, MINN.—The Luley Abbatoir Company plans to install electric power equipment in its proposed cold storage and refrigerating plant, to cost about $160,000. A. F. Gauger, St. Paul, is architect.

TWO HARBORS, MINN.—The purchase of additional generating equipment and a new boiler for the municipal electric and water plant is under consideration by the City Council.

CARROLL, IOWA. — Plans have been completed by the Iowa Light, Heat & Power Company, for providing additional electrical service for Sheldon and surrounding territory, including Sanborn, Primghar, Archer, Hospers and Royden. The cost is estimated at $60,000.

CEDAR RAPIDS, IOWA. — Extensions contemplated by the Iowa Railway & Light Company, include improvements to power plant at Central City, new substations at Walker, Center Point, Quasqueton and one midway between Central City and Center Point, new high-tension line between Central City and Center Point and between Quasqueton and Rowley.

DUBUQUE, IOWA.—Arrangements are being made by the Interstate Power Company, 327 South La Salle Street, Chicago, for the erection of a high-tension line from Dubuque to Center Grove, where it will connect with a similar line extending from Center Grove to Dyersville. This new circuit will also supply power for the construction camp of the company at Delhi, where it is building a new dam and power plant.

CARROLLTON, MO.—Authority has been granted the Kansas City Power & Light Company, Kansas City, to erect a new transmission line from its local plant to the transformer station on the line leading from Carrollton to Bogard, to cost about $3,500. The company is considering the erection of four lines from Carrollton to Bogard and Tina to furnish electric service to farming districts in that territory. A new transmission line is being erected from Armstrong to Roanoke.

GREENVILLE, MO. — The Missouri-Arkansas Power Company has applied for a franchise to install an electric distribution system and supply electricity in Greenville.

JOPLIN, MO. — Authority has been granted the Empire District Electric Company to rebuild its present two-phase, 5,500-volt transmission line from its Grand Falls hydro-electric plant to points in Jasper and Newton Counties; permission was also granted to erect a three-phase, 60-cycle, 33,000-volt line in that region.

ST. LOUIS, MO.—Plans are under consideration by the City Council for the installation of a central control traffic system in the downtown section of the city, to cost about $40,000.

GLENBURN, N. D.—The Borough Council is considering rebuilding the municipal electric light plant recently damaged by fire. New equipment will be installed.

GLEN ULLIN, N. D.—The erection of a transmission line from Glen Ullin to Elgin is contemplated by the Hughes Electric Company, Bismarck.

MINNEWAUKAN, N. D.—The Borough Council is planning to build a transmission line for local light and power service.

NAPOLEON, N. D.—The Northern Power & Light Company, Mobridge, S. D., has obtained an option on the property of the Napoleon Light & Power Company. If taken over the company plans to extend its high-tension transmission line from Mobridge to Napoleon next spring.

BEATRICE, NEB.—Plans are under way by the Gage County Electric Company to build a new standby plant, which will double the capacity of its present station, to cost about $75,000. The company furnishes electricity for the municipal service in Beatrice and Wymore.

KEARNEY, NEB.—The installation of fourteen ornamental lamp standards at the High School grounds, twelve at Third Ward Park and twelve at First Ward Park is under consideration by the City Council.

LOUP CITY, NEB.—The Nebraska Electric Power Company has purchased the Lake Ericson property, a fishing and summer resort in Wheeler County, which it plans to utilize for power development purposes.

KANSAS CITY, KAN.—The construction of an ice plant, to cost about $75,000, is contemplated by the Newland Ice & Cold Storage Company, Seventeenth and State Streets.

Southern States

ATKINSON, N. C.—A franchise has been granted the Tide Water Power Company, Wilmington, to extend its transmission line into Atkinson to furnish electric service here. The cost of the extension is estimated at $25,000.

TARBORO, N. C.—The City Council has issued $45,000 in bonds, the proceeds to be used for extensions and improvements in the municipal electric plant.

GREENWOOD, S. C. — The Savannah River Power Company, recently organized, plans to build a canal from Mount Carmel to a point near Clark's Hill, where it proposes to develop a hydro-electric plant.

CLEARWATER, FLA.—The City Council is considering installing an electric light plant to be operated in connection with the gas and water department.

DELRAY, FLA.—The Florida Power & Light Company, Miami, which has acquired the municipal electric plant, contemplates extensions and improvements to its system in this section.

HASTINGS, FLA.—The construction of a power station and installation of a 250-hp. Diesel engine-driven electric generating unit and an ice manufacturing plant of 15 tons daily capacity, to cost about $50,000, is under consideration by the General Utilities & Operating Company, Baltimore, owner of the Hastings Light & Power Company.

JACKSONVILLE, FLA. — An election will be held Oct. 26 to submit the proposal to issue $2,000,000 in bonds for extensions to the municipal electric system, a large portion of which will be expended on the power station. The installation of additional equipment including three 1,500-hp. boilers and a 25,000-kw. generator, is contemplated.

LAKE ALFRED, FLA.—Bonds to the amount of $20,000 have been issued, the proceeds to be used for the installation of an ornamnntal lighting system on principal streets.

MONTICELLO, FLA. — Arrangements have been made by the General Utilities & Operating Company, Baltimore, for the purchase of the municipal electric plant, subject to the approval of the voters. If taken over, the company will install necessary pumps and wells to deliver a supply of water to reservoirs and mains.

LEWISBURG, TENN.—Bids, it is understood, will soon be asked by the Southern Cities Power Company, Chattanooga, for construction of dams and power house on the Lick River.

MARTIN, TENN.—The Kentucky-Tennessee Light & Power Company, Bowling Green, is erecting a transmission line to connect Trezevant with its transmission system. H. D. Fitch is president.

NEWMARKET, TENN. — The Grasselli Chemical Company, Guardian Building, Cleveland, Ohio, contemplates the installation of electric power equipment at a proposed zinc mill and mining plant in this vicinity. The cost of the entire project is estimated at $300,000.

McALESTER, OKLA. — C. Hess, city manager, is in the market for the purchase of forty ornamental lamp standards and 6,500 ft. of three-conductor armored cable.

WESTVILLE, OKLA. — The municipal electric plant and system has been acquired by the Southwest Power Company, McAlester, which plans to extend its high-tension transmission lines from Watta, Okla., and Lincoln, Ark., to Westville.

FREDERICKSBURG, TEX.—The Central Power & Light Company, San Antonio, which has acquired the electric plant of the Citizens Light & Power Company, plans improvements to the local system, to cost about $35,000.

MIDLAND, TEXAS.—The Midland Light Company, operated by the Southern Ice & Utilities Company, Dallas, plans to install additional equipment at its power plant. Later on a 200 hp. engine-driven unit and accessories will be installed.

UVALDE, TEX. — The Central Texas Power Company, San Antonio, is considering the erection of a transmission line from Uvalde to Knippa, which later will be extended to Sabinal.

WICHITA FALLS, TEX.—The Western Textile Corporation plans to install electric power equipment in its proposed cotton mill, to cost about $300,000.

Pacific and Mountain States

LONGVIEW, WASH.—The Weyerhaeuser Timber Company, Tacoma, plans to install electric power equipment in its proposed local lumber mill, to cost about $450,000.

GOLD MILL, ORE.—Plans are being prepared by the Beaver Portland Cement Company for the construction of a hydro-electric plant for service at its mill, to cost about $150,000. Floyd W. Allen, Railway Exchange Building, Portland, is engineer.

HAWTHORNE, CAL.—The City Council has authorized a survey of the lighting district with view to extensions and improvements.

LA MESA, CAL.—Plans are under consideration for paving and installing ornamental lamps on Lookout and Dare Avenues, to cost about $100,000.

LOS ANGELES, CAL.—The City Council has authorized the installation of ornamental lamps on Beverly Boulevard, using pressed steel standards.

LOS ANGELES, CAL. — Elecric power equipment will be installed in the proposed mechanical shop to be erected at 792 East Fifteenth Street by the Los Angeles Railway Company, at a cost of about $126,000.

SAN DIEGO, CAL.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Oct. 26, for one high-frequency generator, one Morse wave generator, and one electric light cabinet, for the local navy yard (Schedule 6053).

TOMBSTONE, ARIZ. — Bonds to the amount of $25,000, have been issued for a municipal electric light and ice-manufacturing plant.

HELENA, MONT.—The City Council has adopted an ordinance creating an ornamental lighting district, to include Fifth and Sixth, Breckenridge, Warren and West Ewing Streets. The cost of the initial installation is estimated at $12,500. Troy Carmichael is engineer.

LANDER, WYO.—The City Council plans to install an ornamental lighting system in the downtown district.

SUNDANCE, WYO.—The City Council is considering the installation of an ornamental lighting system in the business section.

DE BEQUE, COL.—The City Council is negotiating with the Index Shale Oil Company to furnish electricity for lighting the city.

Canada

VANCOUVER, B. C. — The Defiance Shingle Company plans to install electric power equipment in connection with the proposed rebuilding of its plant, recently destroyed by fire.

GRAND RAPIDS, MAN.—Plans are being prepared by D. N. MacDonald, Winnipeg, Man., and associates for the construction of an 20,000-hp. hydro-electric plant, in connection with a proposed local newsprint mill. The entire project will cost about $2,000,000. Henry Holgate, Montreal, Que., is engineer.

BLENHEIM, ONT. — The Rutherford Milling Company plans to install electric power equipment in its proposed local flour mill and elevator, to cost about $125,000.

SAULT STE. MARIE, ONT.—The Great Lakes Power Company contemplates building an addition to its power plant, including the installation of additional equipment, to cost about $100,000.

Electrical Patents

Announced by U. S. Patent Office

(Issued Sept. 14, 1926)

1,600,038. TRANSFORMER; C. E. Canfield, Pittsfield, Mass. App. filed Feb. 16, 1922. A water-cooled transformer in which danger of leakage from the current of cooling liquid into the oil is eliminated.

1,600,042. ELECTRIC TRANSFORMERS; H. S. Holbrook, Rugby, England. App. filed March 30, 1926. Spacing members adapted to be inserted between transformer disk coils and which are so designed as to allow an insulating fluid to pass through transverse ducts in the members and come in contact with as large a surface of the coils as possible, but the portions of a spacing member which are in contact with the transformer coils are slotted inwardly from their edges.

1,600,048. ALTERNATING-CURRENT MOTOR; N. T. Kelso, Fort Wayne, Ind. App. filed Sept. 8, 1924. Of the single-phase commutator type with a short-circuiting device in which the ratio of the force exerted by the resilient means tending to hold the device in the open-circuited position to the centrifugal force tending to move the device into the short-circuited position reduces as the speed of the motor increases.

1,600,083. ELECTRIC STORAGE BATTERY; C. A. Webster, Dora, Mo. App. filed Jan. 14, 1925. A grid-plate structure which is adapted to be carried in stock by battery repair places, the grid plate being of such construction as to accommodate its use to various makes of batteries.

1,600,094. ELECTRIC SWITCH; J. R. Carlson, Hartford, Conn. App. filed Sept. 27, 1924. Rotary snap switch.

1,600,124. SHORT-CIRCUITING DEVICE; S. E. Miller, Springfield, Ohio. App. filed Oct. 31, 1925. A governor to be attached directly to the motor shaft and which has a plurality of balls mounted in the casing which are adapted to be forced radially outward from the shaft for operating an element which will short-circuit the commutator, being overloaded, spring means being provided to return the centrifugally operated balls to the normal inoperative position when the speed of the motor has been reduced.

1,600,127. PUSH SWITCH; A. H. Nero, New Britain, Conn. App. filed May 10, 1921. Quick-acting mechanism with a long break such as will qualify it for use in hand drills such as electric implements in which heavy currents are used.

1,600,167. ELECTRICAL SWITCH; B. E. Getchell, Plainville, Conn. App. filed Nov. 20, 1924. Means for so mounting the switch blades that they will be anchored against rotary or endwise movement but will be free to adapt themselves laterally to the coacting contacts also, so that no switch-operating shock is transmitted to the edges of the channels in the insulating members in which the blades are mounted. An insulating base having grooves which permit the free movement of the switch blades but which greatly reduce the arcing of the contacts when the switch is operated. A readily detachable and reversible fuse-carrying cover member.

1,600,203. INCANDESCENT LAMP; P. A. Campbell, Newark, N. J. App. filed March 2, 1922. To improve the operation of these lamps and particularly to obviate the discoloration of the bulb which sometimes occurs early in the life of the lamp—that is, before the deposition of a film by the gradual accumulation of material evaporated from the incandescent filament during the normal operation of the lamp.

(Issued Sept. 21, 1926)

1,600,209. SWITCH FOR EXTENSION LAMPS; E. G. Appleton and R. Mooney, Chicago, Ill. App. filed Oct. 25, 1924. Of the type in general use as trouble lamps on automobiles.

1,600,232. LIGHTING FIXTURE; A. R. Krause, Woodhaven, N. Y. App. filed May 2, 1923. Candle-type.

1,600,324. SWITCH MECHANISM; A. Dorsey, Brooklyn, N. Y. App. filed Oct. 24, 1923. For time clocks.

1,600,325. ELECTRIC SWITCH; H. M. Dunlap and D. M. Putnam, Battle Creek, Mich. App. filed April 25, 1923. Pivoted-arm type having contact fingers and adapted for heavy currents.

1,600,332. VOLTMETER; J. Haslauer, Munich, Germany. App. filed Oct. 10, 1925. Pocket voltmeter for direct and alternating current.

1,600,341. HIGH-TENSION SWITCH MECHANISM; C. G. Koppitz, Greensburg, Pa. App. filed Oct. 18, 1920. Using an insulator construction having high mechanical strength.

1,600,348. ARRANGEMENT FOR AUTOMATIC REGULATION OF MOTOR OR GENERATOR FIELDS; E. Mayer, Berlin, Germany. App. filed July 21, 1923. Wherein the speed of the motor or voltage of the generator is governed by means of a three-electrode vacuum tube.

1,600,397. ELECTROLYTE FOR ELECTROLYTIC CELLS; C. C. Carpenter, East Cleveland, Ohio. App. filed June 5, 1922. Containing one or more salts which will combine under electrolytic action with a film forming electrode, and a citrate which will prevent premature coagulation of the salt resulting from the combination of the electrolytic salt or salts with the film forming electrode.

1,600,402. GROUND DETECTOR; L. P. Delsasso, B. F. Dengler and E. R. Stauffacher, Los Angeles, Cal. App. filed Nov. 21, 1921.

1,600,435. FUSE PLUG; H. L. Strongson, Brooklyn, N. Y. App. filed Nov. 6, 1922. Renewable indicating fuse plugs.

1,600,441. ELECTRIC INSULATOR FOR STILLS; G. D. White, Port Arthur, Tex. App. filed Oct. 19, 1923. For use on high-pressure stills employed in the distillation of petroleum products and the like, and to means for protecting such insulators from the action of heat.

1,600,442. STORAGE-BATTERY COVER; T. A. Willard, Cleveland Heights, Ohio. App. filed Sept. 4, 1920.

1,600,457. ELECTRIC SCONCE; D. Dimentberg, Chicago, Ill. App. filed Feb. 17, 1926.

1,600,478. ELECTROLYTIC APPARATUS; F. Lawaczek, Munich-Mittensendling, Germany. App. filed Oct. 13, 1924. In which electrolysis can be performed under economical conditions by means of direct current of high voltage.

1,600,563. INCANDESCENT ELECTRIC LAMP; C. A. Proctor, Los Angeles, Cal. App. filed July 30, 1924. Comprising a filament wire bent upon itself in spaced parallel relation and wound to form a double cylindrical helix having a loop at one end thereof and the two ends of said wire at the other end thereof, said wire ends together constituting one connection to said filament, and a contacting supporter for said helix operatively engaging said loop by being extended therethrough, said supporter constituting the other connection to said filament, whereby the two halves of said filament are connected in parallel.

1,600,564. ELECTRICAL PLUG SOCKET; L. Propp, New York, N. Y. App. filed Nov. 14, 1921.

1,600,595. ELECTRODE FOR LUMINESCENT TUBES; P. F. Lebrun, Paris, France. App. filed Sept. 8, 1925.

1,600,675. ELECTRIC CAN-OPENING DEVICE; J. A. Kaye, Sault Ste. Marie, Ontario, Canada. App. filed Jan. 8, 1926. In which the head of the can is removed as a unit by melting the solder at the joint.

1,600,730. PROCESS OF AND APPARATUS FOR USE IN ELECTROLYTIC PURIFICATION OF GRAPHITE; L. C. Haffner, Chicago, Ill. App. filed July 31, 1922.

1,600,751, 1,600,752, 1,600,753. APPARATUS FOR CONTROLLING ELEVATORS; F. E. Boardman and F. E. Boardman, Jr., St. Louis, Mo. Apps. filed March 26, 1923, May 6, 1924, and April 12, 1924.

1,600,760. THERMAL CIRCUIT CONTROLLER; J. Grigas, Shenandoah, Pa. App. filed July 8, 1925. As used on irons.

1,600,775. PROTECTIVE DEVICE FOR ALTERNATING-CURRENT MOTORS; A. S. Peaslee, Oak Park, Ill. App. filed Nov. 24, 1922. When used in connection with a household washing machine or similar device it may be so constructed as to combine the functions of certain devices as follows, namely, automatic maximum load protective device, automatic no-voltage protective device, manually operated starting switch and manually operated stopping switch.

1,600,827. SPEED REGULATOR FOR HIGH-FREQUENCY ALTERNATORS; M. Latour, Paris, France. App. filed July 23, 1923.

1,600,840. SEARCHLIGHT; E. J. Murphy and L. P. Hutt, Schenectady, N. Y. App. filed July 9, 1920. A new design of arc lamp and ventilation system adapted both to the open or closed type of searchlights.

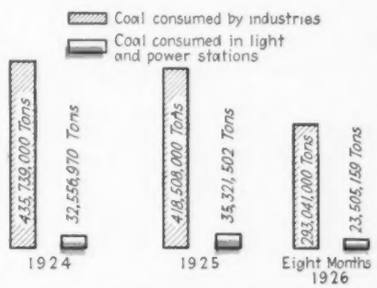
Business Facts for Electrical Men

Selected Statistics Presented Graphically for the Use of All Interested in Analyzing the Trend of the Electrical Business

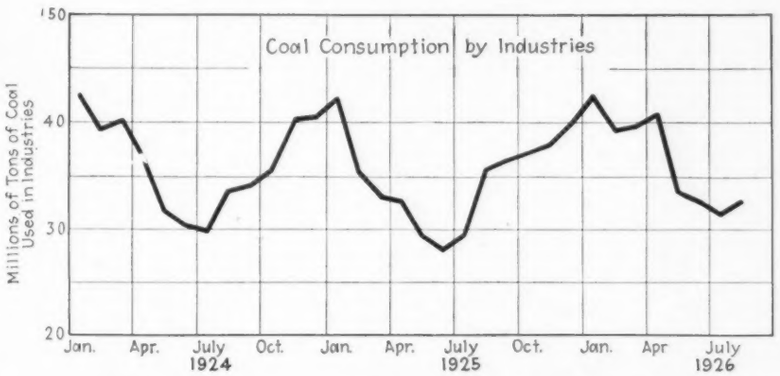
Central-Station Operations as a Representative Manufacturing Industry

ALTHOUGH the consumption of coal by central electric light and power stations is but a twelfth as great as that for industrial purposes, the fluctuations of the two are similarly striking. The comparison is suggested by the recent publication, by the National Association of Purchasing Agents, of a chart showing among other things the industrial consumption of anthracite and bituminous coal in the United States and Canada, which is here contrasted with corresponding central-station statistics published in previous issues of the ELECTRICAL WORLD. The central-station figures are for the United States alone, but if those for Canada were available, they would little more than increase the totals without appreciably affecting the trend.

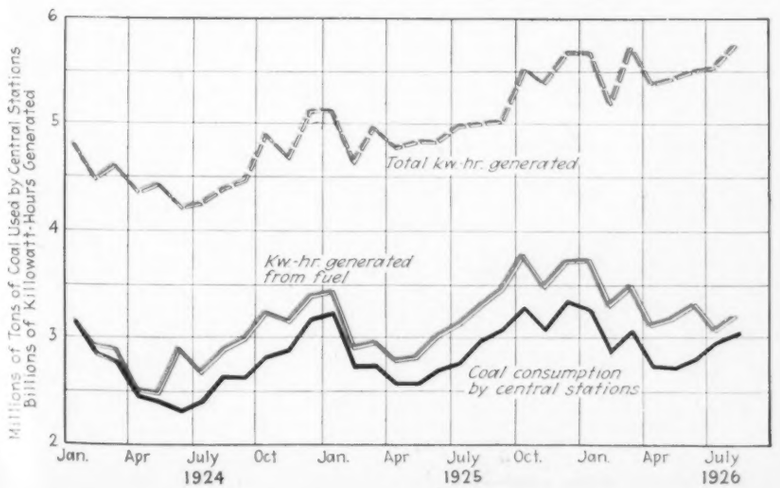
Both curves show the same regular fluctuations, with a winter peak exceeding the summer consumption by 40 per cent or more in the case of the industries where we should expect a heavy demand for heating; the range for the central stations is somewhat smaller, but the same swings are present.



Above, Coal Consumed by Industries in the United States and Canada, and by Central Light and Power Stations in the United States. Below, Monthly Industrial Consumption



Kilowatt-Hours Generated Monthly by Central Electric Light and Power Stations, and Coal Consumed



The great difference in coal consumption is not due to a corresponding difference in installed horsepower. As a matter of fact, the aggregates of steam engines and turbines of primary power in the manufacturing industries and in the central electric light and power stations were substantially equal three years ago and close to 17,000,000 hp. At present the last named probably exceed the other in rating. Much of the coal goes into the chemical and allied industries, which include the manufacture of coke. The 1923 figures, the latest available for that group of industries, show slightly less than 1,500,000 hp. installed, but a coal consumption around 106,000,000 tons. Of the balance a considerable additional amount no doubt goes into heating, but after all allowances have been made it seems clear that the consumption per horsepower in the industrial plant is relatively high.

Coming to the energy output, it is evident that the total generated, by both water and steam, while exhibiting the same seasonal changes as the fuel consumption, does so in a much less marked degree. There is a uniform upward trend, with variations of less than 10 per cent from it. The abundance of water in spring and its relative scarcity in fall have the effect of advancing the curve of fuel-generated energy by about a month, as compared with the fuel curve for industry in general.

The increasing efficiency of central-station operation, even in the short period covered by the chart, is not fictitious, but is part of a well-marked movement that has long been observable. The curve of energy output from fuel includes operations using oil and natural gas, but more than 90 per cent comes from coal, which is, of course, the predominant fuel for the country as a whole.

Most of the data for statistics in the ELECTRICAL WORLD are gathered by it from original sources. Privilege is freely given to readers of the ELECTRICAL WORLD to quote for use these statistics for any legitimate purpose. While there is no requirement that the source of data be given, yet it would help the ELECTRICAL WORLD in obtaining and compiling further basic information if those who make use of these statistics would give credit to the ELECTRICAL WORLD.

Sustained Industrial Activity in the North Central States

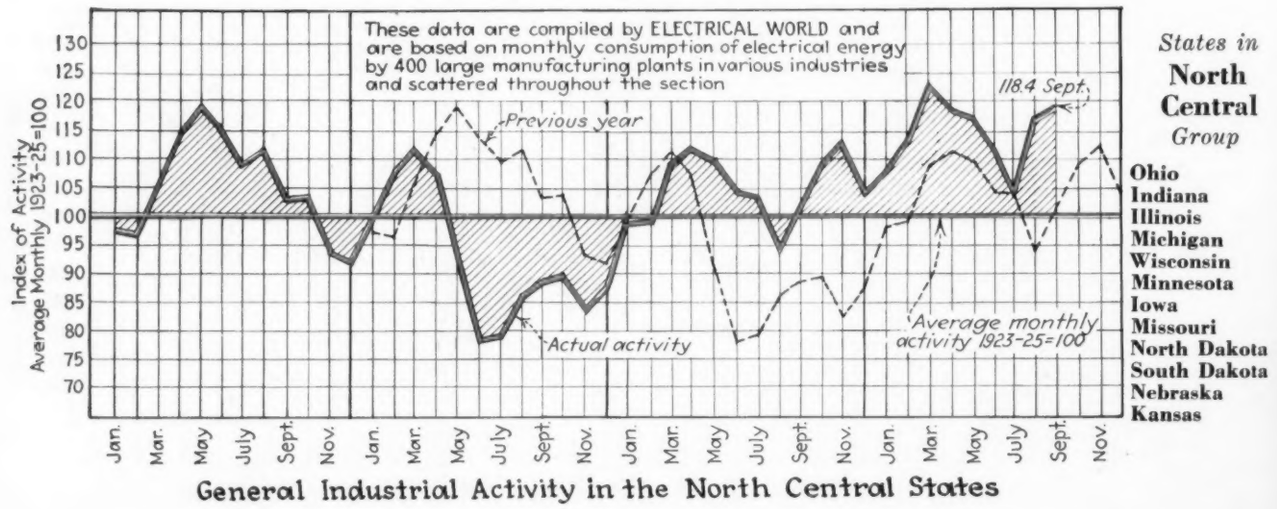
ACTIVITY in the manufacturing plants of the North Central States during September was slightly above that reported for August and very materially above that of last year. The metal industries and the lumber industry reported September operations over those of August, but the automotive, paper, chemical and textiles industries reported September operations slightly under those of August. September manufacturing activity in the section for industry as a whole was 16.7 per cent over that reported for September of last year, and 18.4 per cent over the average monthly activity for the past three years. Such is the picture of industrial operations painted by the ELECTRICAL WORLD, based upon the monthly consumption of electrical energy of about four hundred large manufacturing plants scattered throughout the section.

The returns received by the ELECTRICAL WORLD indicate that September general industrial activity in the North Central States was 18.4 per cent above the average monthly activity for the past three years, this figure being unadjusted for seasonal variation but weighted in accordance with the various industries. The prosperous condition of industry in the North Central States today is even more clearly indicated when the fact is included that in September of last year general industry in this section was operating at only 1.4 per cent above the average monthly.

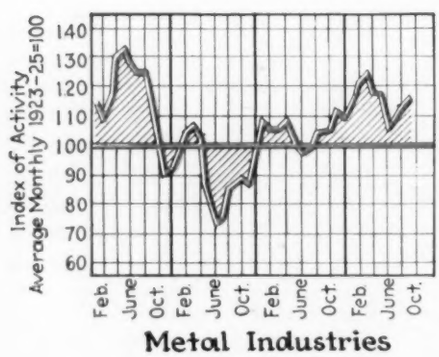
The metal industries, which include rolling mills and iron and steel mills, as well as ferrous and non-ferrous fabricating branches of the industry, were operating during September at 2.4 per cent above the August operations and 20.0 per cent over September of last year. The automotive plants of this section reported slightly decreased operations. During September these plants were operating at 3.7 per cent under August, but were still operating at 26.8 per cent over the activity reported during September of last year. Activity in the lumber industry during September was 5.7 per cent over August and was 15.8 per cent over the operations of September of last year. September activities in the textiles industry were almost on a par with those of August.

"Electrical World" Barometer of Industrial Activity in the North Central States

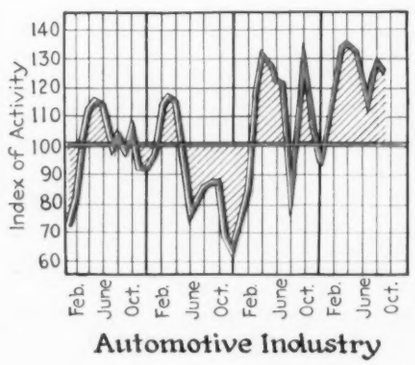
(Data Unadjusted for Seasonal Variation)



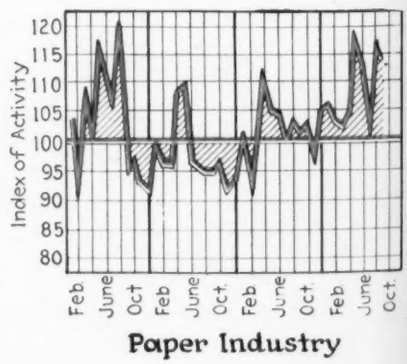
General Industrial Activity in the North Central States



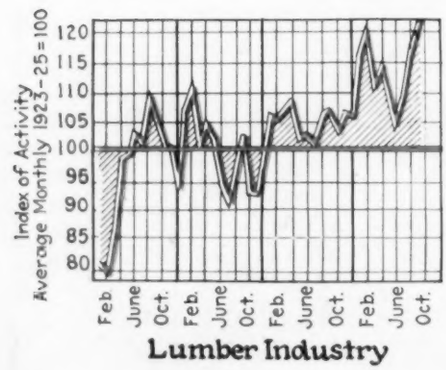
Metal Industries



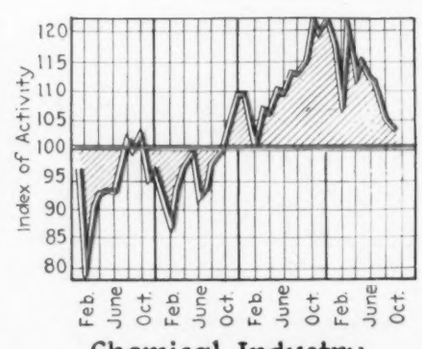
Automotive Industry



Paper Industry



Lumber Industry



Chemical Industry

Textiles Industry